(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 279 598 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.01.2003 Bulletin 2003/05

(51) Int Cl.[7]: **B65B 25/14**, B65B 11/10, B65B 59/02

(21) Application number: **02016222.8**

(22) Date of filing: **19.07.2002**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **24.07.2001 IT BO20010471**

(71) Applicant: **Gamberini, Gianluigi**
40137 Bologna (IT)

(72) Inventor: **Gamberini, Gianluigi**
40137 Bologna (IT)

(74) Representative: **Dall'Olio, Giancarlo**
INVENTION s.a.s.,
Via delle Armi, 1
40137 Bologna (IT)

(54) Machine for packaging stacks of articles in wrapping sheets

(57) The machine includes a first line for conveying and separating the piles of articles; a second line for feeding heat-weldable wrapping sheets to a working station; a third line, fed upstream with piles coming from the first line and passing crosswise the working station, in which at least one pile is moved to strike the sheet placed in waiting position in the working station. The sheet is progressively folded around a longitudinal outline of the pile, and the relative parallel edges are overlapped and heat-welded. The second line (2) includes a first working group (G1) aimed at receiving a wrapping sheet (F,P*) from conveying means (16), situated upstream. The sheet (F,F*) corresponds to a size (P,P*) of a pile of articles and is connected to a relative film (K) by a pre-broken line. A second working group (G2), arranged in cascade to the first group (G1), from which it receives the sheet, is aimed at cooperating with the first group to first detach the sheet (F,F*) from the film at the pre-broken line and then to place the sheet vertically in the working station (So). A control unit (C) operates and verifies the first and second groups (G,1,G2).

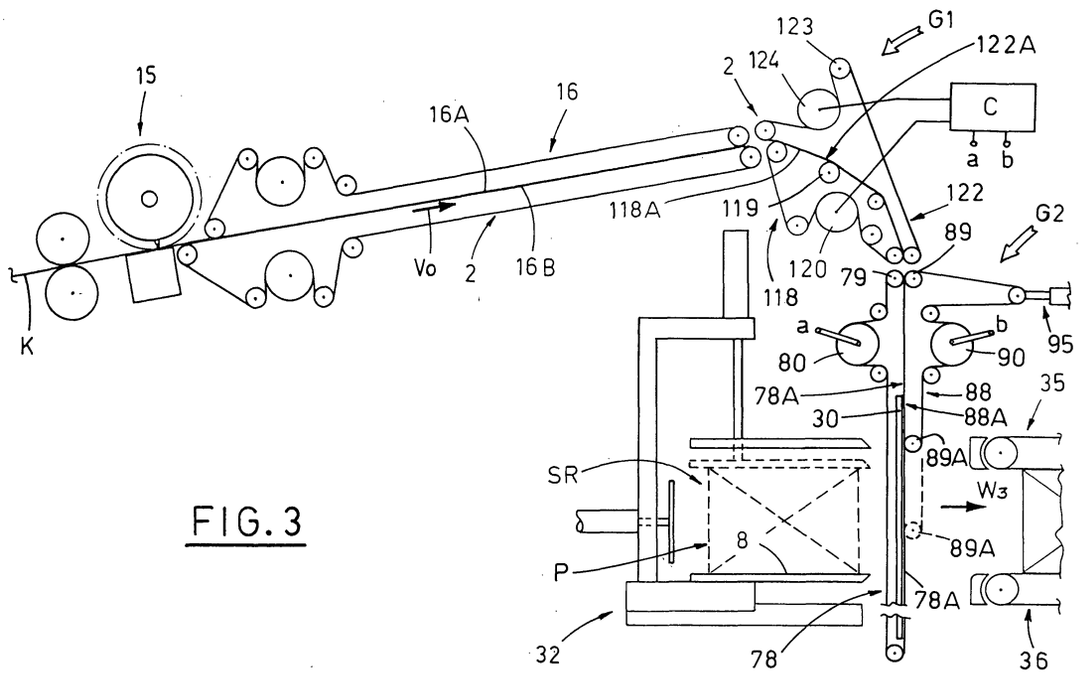

FIG. 3

EP 1 279 598 A2

Description

DESCRIPTION OF THE INVENTION

[0001] The Patent Application no. BO2000A 000733 of the same Applicant, describes a machine for packaging piles of multiply paper articles, or other articles, into relative wrappings obtained from heat-weldable wrapping sheets.

[0002] Basically, the machine includes: a first line for conveying and separating the piles; a second line for intermittent feeding heat-weldable wrapping sheets to a working station, where each sheet is positioned vertically and kept in this position; a third line, fed intermittently with piles coming from the first line and passing crosswise the above mentioned working station, aimed at moving each pile toward the above mentioned sheet arranged in wait position in said working station. The pile goes to strike against the sheet and then the sheet is folded around the longitudinal outline of the pile to allow the wrapping sheet parallel edges to be overlapped in order to be heat-welded.

[0003] Figure 1 shows a schematic view of technical-functional aspects protected by the above mentioned Patent Application.

[0004] The above mentioned second line 2 includes a reel (not shown), from which a heat-weldable film K, for example polyethylene, is unwound continuously.

[0005] The film K passes through a so-called slow branch 16, more precisely between opposite runs of pairs of endless conveyors 16A, 16B, only one pair of which is shown in Figure. The runs are moved with a constant speed V_o.

[0006] A cutting group 15 is situated upstream of the slow branch and makes, stepwise, transversal cut lines (defining as many pre-broken sections) spaced apart by a predetermined step in accordance with the pile size.

[0007] It is to be pointed out that the mutual contact between the opposite runs 16A, 16B allows on one hand to pull the film K, but on the other hand, it allows slipping of a sheet F, obtained by tearing the pre-broken section, between the facing runs.

[0008] A working group 70, situated downstream of the slow branch 16, takes over the leading edge of the film K going out of the slow branch, detaches the sheet F from the film K, pulls the detached sheet F up to the above mentioned working station So and keeps it still therein.

[0009] The group 70 includes first means and second means.

[0010] The first means include a pair of first endless belts 18, only one of which is shown in Figure, mounted around idler wheels 19 and a driving wheel 20, to define a vertical straight section in the region of the station So, and engaging the edges of a face of the sheet F.

[0011] The second means include a pair of second endless belts 22 (only one of which shown in Figure), mounted around idler wheels 23 and a driving wheel 24 to engage the edges of the other face of the sheet F and to define a short vertical straight section in the region of the station So.

[0012] The mutual spatial arrangement of the first and second endless belts 18, 22 defines two facing runs 18A, 22A, having one side situated in cascade to the runs 16A, 16B of the slow branch and the other side leading to the station So.

[0013] The height of the lower idler wheel 23A is adjustable vertically during size change over operation (see position M indicated with broken line) by acting on tensioning means 25: consequently, also the vertical straight section of contact between the facing runs 18A, 22A of the first and second belts 18, 22 changes.

[0014] At the station So, the inner runs of the first belts are connected to means 30, which can be connected to a vacuum source: for this purpose, the first belts feature through holes set into communication with these means.

[0015] Upstream of the working station So, more precisely in a receiving station SR, which is integral part of the above mentioned third line, there is a slide 32 moving longitudinally according to to-and-fro strokes, along the track defined by the direction W3.

[0016] The lower part of the slide carries a base plate 8, while the upper part of the slide carries a presser plate 33, parallel to the base plate 8, and the side part of the slides supports a pusher 34, perpendicular to the base plate.

[0017] Two endless conveyors 35, 36, arranged one over the other, are situated downstream of the working station So; the upper run 35A of the lower conveyor 35 is coplanar with the support base plate 8.

[0018] Obtaining the sheet F, its transferring to the station So, its keeping therein and finally, its extrusion by the pile P, are deducible from the Figure 1, as well as from the enclosed Figure 2.

[0019] The first and second endless belts 18, 22 are operated with the same speed, whose progress in function of time is shown in Figure 2.

[0020] In the time interval T1, the speed VA is equal to the speed V0 of the slow branch 16; in this interval, the leading edge of the film K enters between the initial parts of the facing runs 18A, 22A.

[0021] The same speed facilitates and optimizes the entrance action.

[0022] Afterwards, the speed of the belts reaches suddenly the maximum value VB and maintains it for the time interval T2*; the quick acceleration imposed to the film makes the sheet F detach from the film due to breaking of the precut section made by the cutting group 15.

[0023] The sheet F, not hindered by the slow branch 16, is conveyed to the station So and passes through it because its edges are kept adherent to the inner run 18C due to the operation of the means 30.

[0024] When the time interval T2, practically equal to T2*, is finished, the speed is set to zero and the means 30 are still operated: in this situation, which is maintained for a time interval T3, the sheet F is stabilized in

vertical position, normal to the direction W3, because its upper part is clamped between the facing runs 18A, 22A of the first and second belts 18, 22 and kept adherent to the first belts due to the suction action of the means 30.

[0025] In step relation with the steps just mentioned, the presser plate 33 compresses the pile P and reaches the level of the lower run 36A of the upper conveyor 36, and the slide 32 translates in the direction W3, which brings the ends of the base plate 8 and the presser plate to strike the sheet F.

[0026] In step relation with the above mentioned striking action, the speed of the first and second belts 18, 22 reaches a speed VC, equal to the so-called "extrusion" speed.

[0027] In step relation with the slide stop, the pusher 34 is operated to "extrude" the pile P, compressed between the opposite surfaces of the base plate 8 and the presser plate 33, and to introduce it between the runs 35A, 36A of the conveyors 35, 36.

[0028] The speed VC, with which the belts 18, 22 feed the upper portion of the sheet is equal to the extrusion speed of the pile.

[0029] After the pile P had been introduced between the above mentioned runs, the slide 32 moves back, the pusher 34 moves back with respect to the slide and the presser plate 33 rises: the initial conditions are restored.

[0030] According to an interesting variant, the speed of the first and second endless belts 18, 22 is not set to zero; in other words, the speed VB passes directly to the speed VC (see the portion GX indicated with broken line in Figure 2) : this allows reducing the stresses caused to the sheet F by the speed variations and has the positive effect, when necessary, to it possible reduce the time needed to place the sheet F in waiting position in the working station So.

[0031] The Patent Application num. BO2001A 000297 of the same Applicant proposes interesting variants of the just described technical solution.

[0032] Actually, the functions of the presser plate 33 and of the base plate 8 are fulfilled by as many endless conveyors, operated in a suitable moment to fulfill also the function of the pusher, which therefore, is not necessary any more.

[0033] Consequently, only one sheet F is present between the facing runs of the first and second belts 18, 22, in the interval TO, as considered from the entrance moment of the film K leading edge between the belts to the end moment of the extrusion step; obviously, the extension of the first belts 18 allows to pull the sheet F relative to the maximum size of the pile P, and place it in the station So.

[0034] Sheets of smaller length are used for piles, whose size is smaller than the maximum one.

[0035] The technical solutions proposed by the two above mentioned Patent Applications do not allow to increase the production rate when the length of used sheets is smaller than the maximum one, because the course that the sheet must cover is always the same.

[0036] Consequently, with the sheet F placed in the working station So, a piece of course is defined between the terminal part of the sheet F and the inlet of the facing runs of the first and second belts 18, 22, which must be covered by the sheet anyway and cannot be occupied by the next sheet, due to the above reasons.

[0037] In other words, the course is the same independently from the size of the sheet; when the size gets smaller, the machine speed, expressed in the number of packages per minute, increases, and consequently, also the sheet speed increases.

[0038] The machines produced in accordance with the technical solutions proposed by the above mentioned Patent Applications, allow to obtain an acceptable speed for the sheets of maximum size, with reference to the feeding of the sheet F to the working station, since the number of packages per minute is minimal. These machines, however, reaches an excessive speed with reference to the sheets of smaller size, since the speed increase results from the increase of the number of packages which the machine can produce per minute.

[0039] The object of the present invention is to propose a machine for packaging piles of articles into relative wrappings obtained from wrapping sheets, which allows an adjustment of the sheet feeding frequency to a working station, in relation to the length of the sheets, i. e. to the size of piles.

[0040] Another object of the present invention is to propose a machine which allows to increase the feeding frequency when the sheets length diminishes, all obtained in a rapid and automatic way, and without off time for the machine.

[0041] A further object of the present invention is to propose a machine which achieves the above mentioned objects by a technical solution, which is simple, in comparison to the obtained results, and reliable.

[0042] The above mentioned objects are obtained in accordance with the contents of the claims.

[0043] The characteristic features of the present invention will be pointed out in the following description of a preferred, but not unique embodiment, with reference to the enclosed drawings, in which:

- Figures 1, 2 show some technical-functional aspects of the technical solution described in the introduction;
- Figure 3 shows a schematic view of the technical-functional aspects characterizing the proposed machine;
- Figures 4, 5 are schematic views of two working steps obtained by the machine proposed by the invention.

[0044] In the Figures 3, 4, 5 the same reference numbers have been used for the elements and/or devices

common with the solution shown in Figure 1, more precisely for what concerns the slow branch 16, the station So, the station SR and the conveyors 35, 36.

[0045] Two working groups G1, G2, first and second respectively, are positioned one the other and in cascade to the slow branch 16.

[0046] The second working group G2 is situated at the above mentioned working station So.

[0047] The first group includes a pair of first endless conveying belts 118, only one of which is shown, mounted around idler wheels 119 and a driving wheel 120.

[0048] The inner runs 118A of the first belts face opposite inner runs 122A of corresponding second endless conveying belts 122 mounted around idler wheels 123 and a driving wheel 124.

[0049] The facing runs 118A, 122A of the belts engage, on opposite sides, the edges of the sheet F.

[0050] The driving wheels 120, 124 are operated synchronously by suitable motor means, not shown, controlled by a control unit C.

[0051] The second group G2 includes a pair of first endless working belts 78, only one of which is shown, trained around idler pulleys 79 and a driving pulley 80.

[0052] The inner run 78A of the belts passes through the station So and is acted on by suction means 30, which perform their action through holes made in the belts.

[0053] The initial portions of said inner runs 78A face the inner runs 88A of corresponding second endless working belts 88, trained around idler pulleys 89 and a driving pulley 90; the height of the lower idler wheel 89A is adjustable by tensioning means 95.

[0054] It is to be specified that the inner runs 78A of the first belts 78 engage the edges of one face of the sheet F, while the inner runs 88A of the second belts, facing the inner runs of the first belts, engage the edges of the other face of the sheet in the upper part up to the working station So.

[0055] The driving wheels 80, 90 are operated synchronously by suitable motor means, not shown, controlled by a control unit C.

[0056] Consequently, the two groups G1, G2 are operated independently one from the other, which is extremely advantageous for the reasons explained below.

[0057] Figure 3 refers to the maximum size of the pile P, as the example.

[0058] Figures 4, 5 refer to the size P* smaller than the maximum one.

[0059] With reference to Figure 4, the reference F* indicates the sheet corresponding to the above mentioned size P*; this sheet is placed vertically and held in this position by the action of the facing runs 78A, 88A of the first and second working belts 78, 88, and by the adherence action performed on the inner runs 78A of the first belts 78 by the suction means 30.

[0060] It is to be specified that the sheet F* placed in the station So does not engages the belts of the first group G1 (Figure 4).

[0061] As mentioned in the introduction, the translation (in direction W3) of the slide 32 causes the ends of the base plate 8 and of the presser plate 33 to strike against the sheet F*; in step relation with this striking action, the first and second working belts 78, 88 are operated synchronously with the speed which is equal to the extrusion speed and which is maintained until the pile P* and the relative sheet F*, wrapping progressively three sides of the pile, are wholly introduced between the opposite runs 35A, 36A of the conveyors 35, 36.

[0062] After the above introduction, the slide 32 moves back and the pusher 34 moves back with respect to the slide.

[0063] During the just described operations, the leading edge KA of the film K is introduced between the facing runs 118A, 122A of the belts of the first group G1, which pull the film K with a speed equal to the speed Vo of the slow branch 16: this is possible, because the first group G1 is not engaged by the previous sheet F*.

[0064] In step relation with the disengaging of the slide 32 from the working station So, the leading edge KA of the film K is situated near the final part of the opposite runs 118A, 122A; therefore, the leading edge KA can be introduced between the opposite runs 78A, 88A of the first and second working belts 78, 88.

[0065] After the leading edge KA of the film K had been introduced between the opposite runs of the belts of the second group G2, the latter are suddenly accelerated, synchronously with the belts of the first group, so as to detach the sheet F* from the film K in the region of the pre-broken line (Figure 5).

[0066] After the above sheet F* had been disengaged from the belts of the first group, the latter are brought back to the speed Vo of the slow branch.

[0067] The working belts of the second group are aimed at transferring the sheet F* to the station So, where it is placed and held in the already described way.

[0068] Consequently, due to the proposed solution, the leading edge KA is moved as close as possible to the beginning of the opposite runs 78A, 88A of the working belts of the second group, and then to the working station So.

[0069] This feature allows to adapt the time needed to place the sheet F* in the station So, since the leading edge KA of the sheet can be placed as close as possible to the beginning of the opposite runs 78A, 88a of the working belts when the length of the sheet reduces: consequently, the distance to cover, and therefore, the speed, reduces together with the sane "machine duty cycle".

[0070] This advantageous feature results from the fact that the sheet F* placed in the station So engages only the belts 78, 88 of the second group G2, so the opposite runs 118A, 122A of the belts of the first group allow the leading edge KA of the film to be moved close to the beginning of the opposite runs of the second group, and then to the working station So, although the latter are still engaged by the extrusion step.

[0071] Consequently, it is possible to increase the frequency, with which the sheets F* can be placed in the station So together with the reduction of the size: therefore, it is possible to increase the machine production rate, i.e. the number of packages produced per minute.

[0072] The groups G1, G2 are structurally independent, therefore they can be operated in different ways.

[0073] Nothing prevents from operating them synchronously in any working step, so as to re-propose the conditions of the technical solutions mentioned in the introduction.

[0074] This is extremely advantageous for the maximum possible size of the pile, or for sizes beyond a predetermined value, which need such dimensions of a sheet F that, when placed in the working station So, it engages the opposite runs 78A, 88A of the working belts as well as the opposite belts 118A, 122A of the conveying belts.

[0075] The advantages of the technical solution proposed by the present invention do not depend on the conformation of the station SR, which can be of the type shown in the enclosed Figures or of the type protected by the mentioned Application no. BO2001A000297.

[0076] Consequently, the proposed machine, with reference to feeding sheets F, F* in the working station So, can increase the production rate by passing from the maximum size P of the pile to the smaller sizes P*.

Claims

1. Machine for packaging piles of articles into relative wrappings obtained by wrapping sheets, of the type including:

   - a first line for conveying and separating said piles:
   - a second line for feeding intermittently heat-weldable wrapping sheets to a working station, in which each sheet is placed vertically and held in this position;
   - a third line, fed intermittently upstream with piles coming from said first line and passing crosswise said working station, for moving at least one pile to strike the above mentioned sheet placed in waiting position in said working station, with progressive folding of the sheet around a longitudinal outline of the pile, and overlapping the relative parallel edges, which are heat-welded;

   characterized in that said second line (2) includes:

   - a first working group (G1) aimed at receiving a wrapping sheet (F,F*) from conveying means (16), situated upstream, said sheet (F,F*) corresponding to a size (P,P*) of a pile of said articles and connected to a relative film (K) by a pre-broken line;
   - a second working group (G2), situated in cascade to the first group (G1), from which it receives said sheet, the second working group being aimed at cooperating with said first group to first detach said sheet (F,F*) from the film in the region of said pre-broken line, and then to place the sheet vertically in correspondence to said working station (So) ;
   - a control unit (C) for operating and verifying said first and second groups (G,1,G2).

2. Machine, according to claim 1, **characterized in that** the extension of said second group (G2) allows receiving the entire said sheet (F,F*), which is included in a predetermined range of sizes (P,P*) of said pile.

3. Machine, according to claim 1, **characterized in that** said two groups (G1,G2) are operated with the same speed when both engage the sheet (F, F*).

4. Machine, according to claim 1, **characterized in that** the total extension of the two groups (G1,G2) allows receiving said sheet, which is included in a predetermined range of sizes (P,P*) of said pile.

5. Machine, according to claim 1 or 3 or 4, **characterized in that** said first group (G1) includes:

   at least one pair of first endless conveying belts (118), operated synchronously and mounted around relative wheels (119), one of which (120) is a driving pulley;

   at least one pair of second endless conveying belts (122) operated synchronously and mounted around relative wheels (123), one of which (124) is a driving pulley;

   said first and second conveying belts being arranged spatially with the relative facing runs (118A,122A) engaging, on opposite sides, the edges of said sheet (F,F*);

   motor means, controlled by said control unit (C) to drive said driving wheels (120,124) to rotate synchronously.

6. Machine, according to claim 1 or 2 or 3 or 4, **characterized in that** said second group (G2) includes:

   at least one pair of first endless working belts (78), mounted around relative pulleys (79), one

of which (80) being a driving pulley, operated synchronously and

arranged spatially in such a way as to engage the relative edges of a face of said sheet (F,F*) and to define a vertical section passing through said working station (So);

at least one pair of second endless working belts (88), mounted around relative pulleys (89), one of which (90) being a driving pulley, arranged spatially in such a way that the runs (88A), which face runs (78A) of said first belts (78), engage the relative edges of the other face of said sheet upstream, up to said working station (So);

suction means (30), connected to the vertical section of said first belts (78) at least in the region of the working station, aimed at making the edges of the sheet face related to said belts to adhere to said belts;

motor means, controlled by said control unit (C) for driving said control unit into synchronous rotation.

7. Machine, according to claim 6, **characterized in that** at least one pair of pulleys (89A), around which said second belts (88) are mounted, and which are situated in the working station (So), moves vertically.

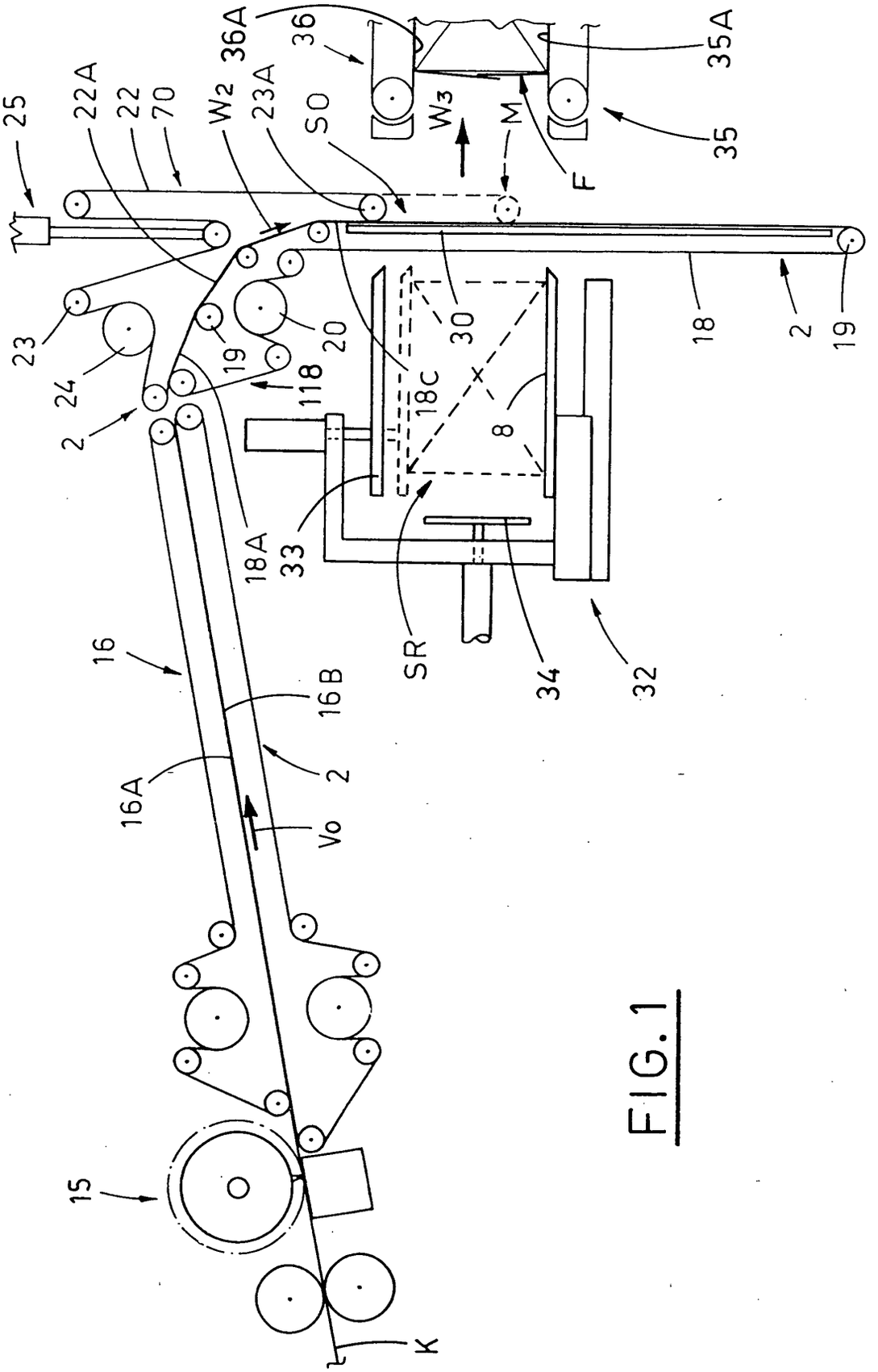
25
22A
22
70
W2
36A
23A
SO
36
W3
M
F
35A
35
23
24
2
19
20
118
18c
30
8
18
2
19
18A
33
SR
34
32
16
16B
16A
2
Vo
15
K

FIG. 1

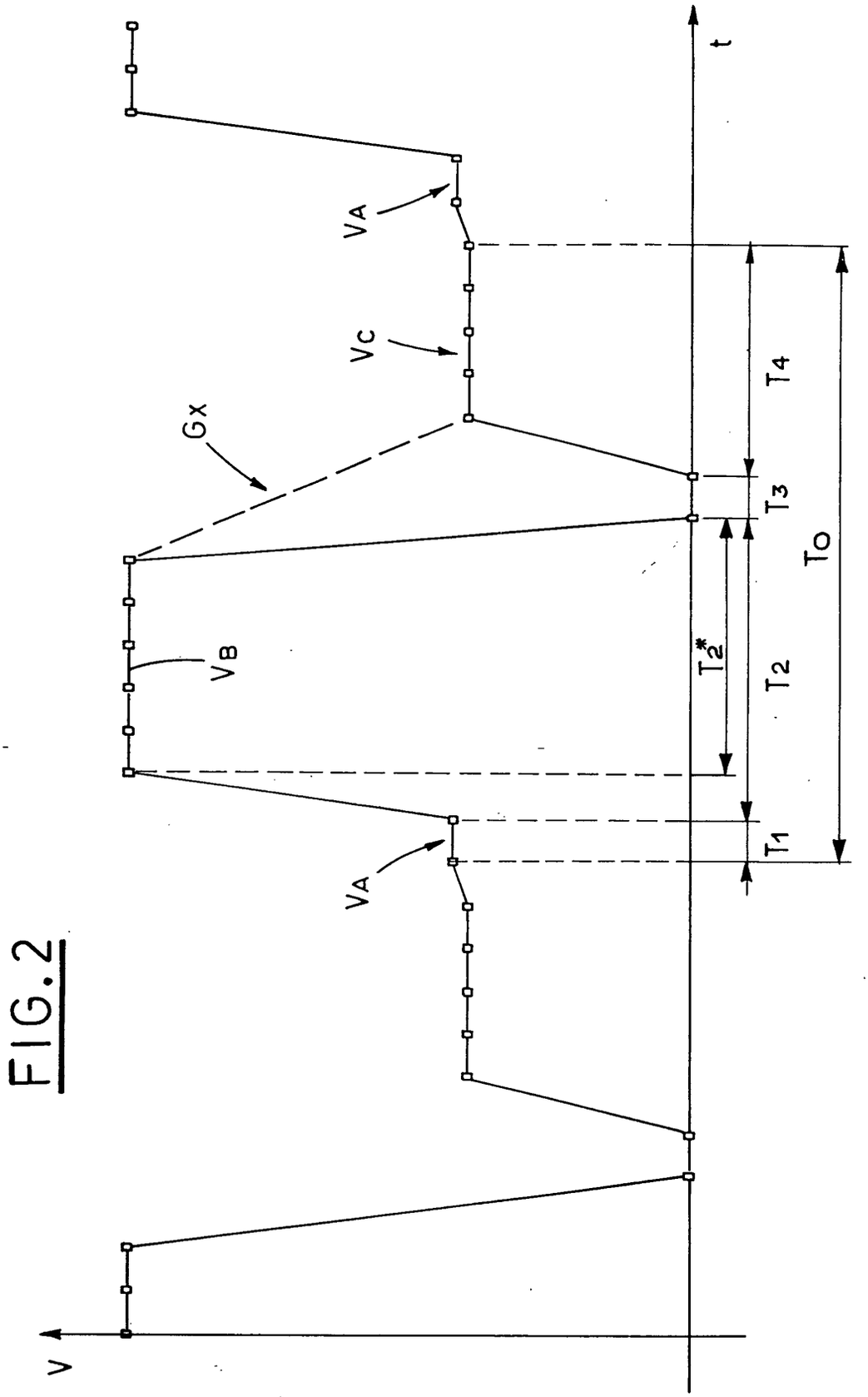

FIG.2

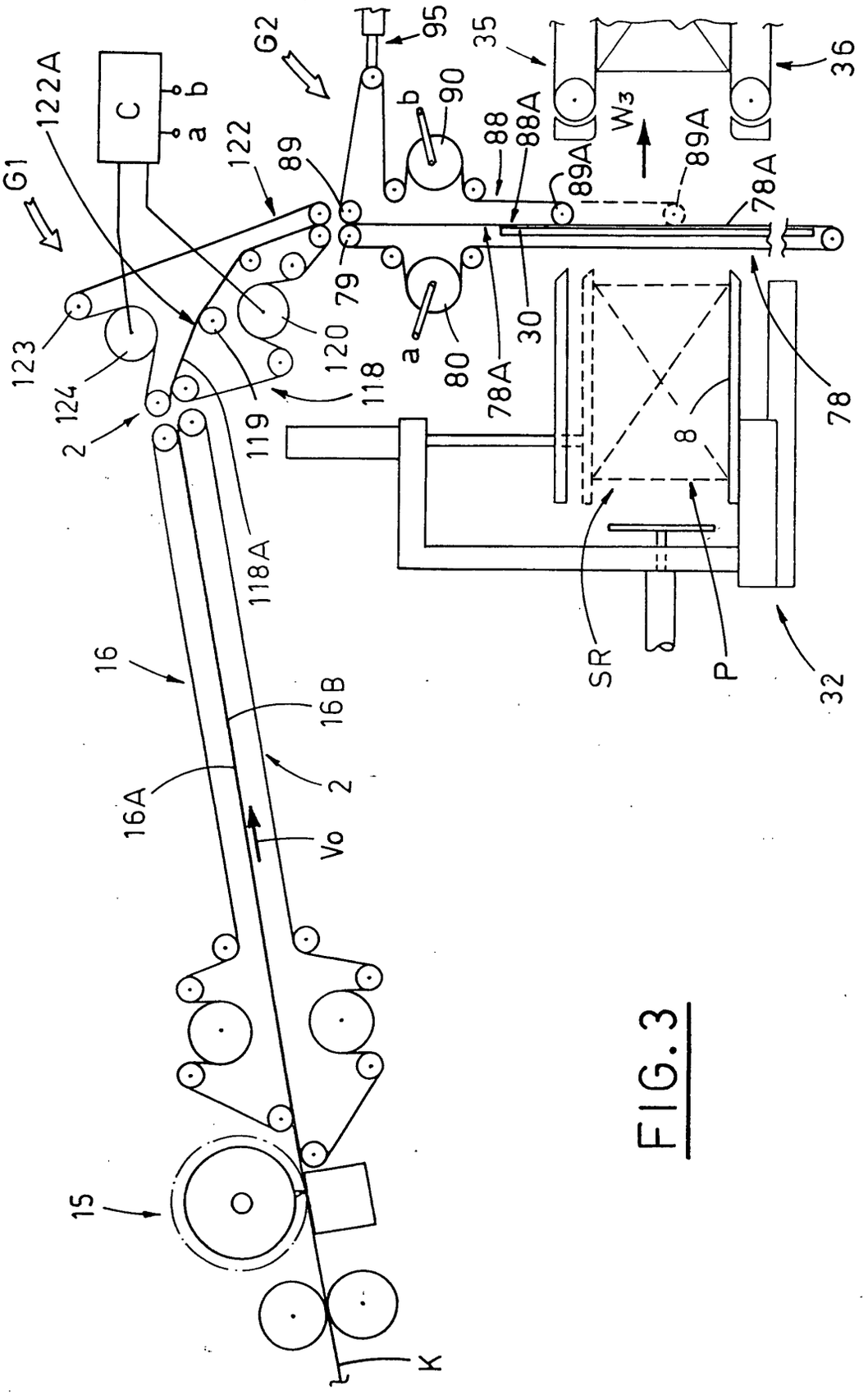
G1
G2
122A
C
a
b
122
89
95
90
88
88A
89A
35
36
W3
78A
123
124
2
120
118
119
79
80
30
118A
16
16B
16A
Vo
15
K
8
78
SR
P
32

FIG. 3

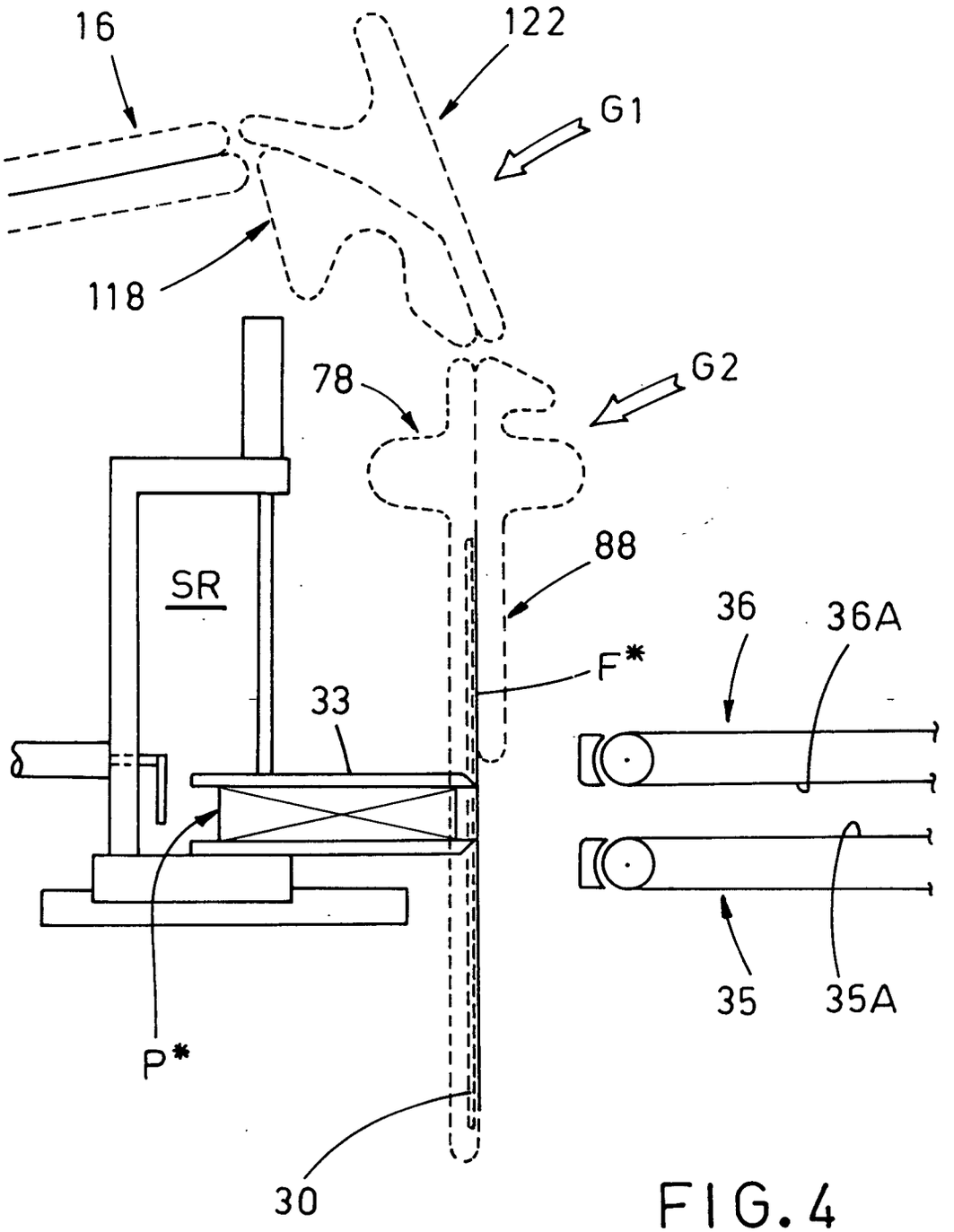

FIG. 4

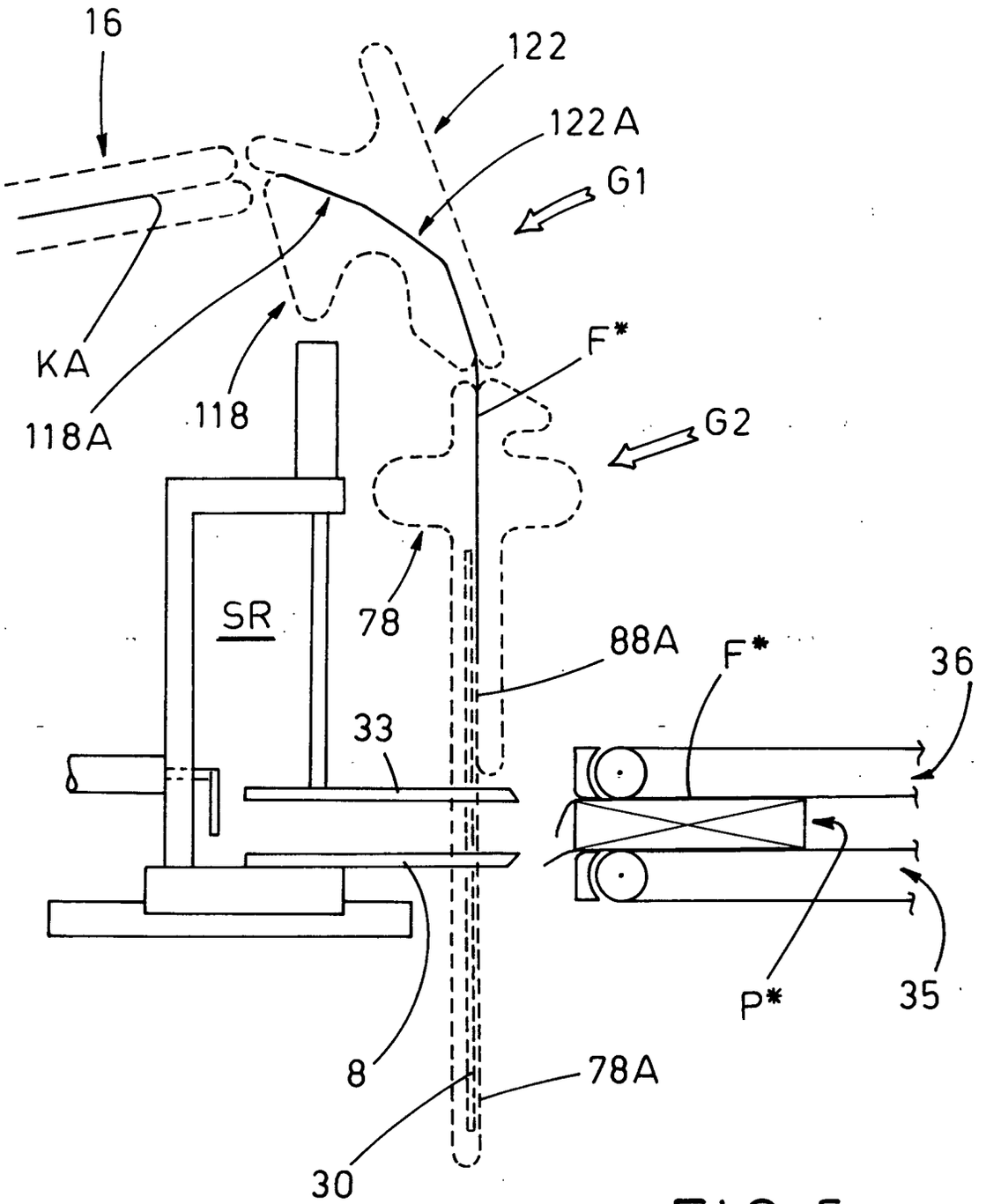

FIG. 5