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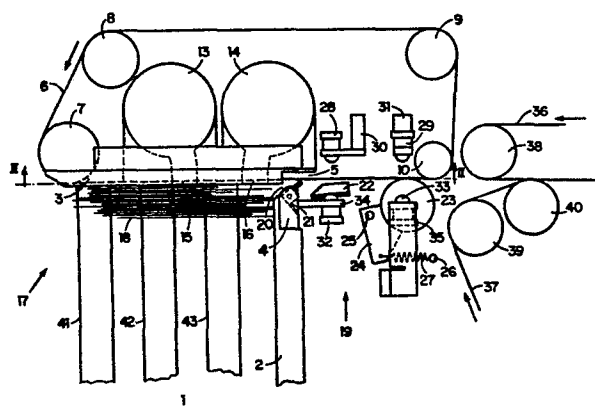
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⑤④ **Singler device and vibration damping material.**

⑤⑦ The singler device for flat articles, e.g. letters, includes an input position with first (13) and second (14) suction means mounted along one face of a traveling suction belt (6), a passage (20), and a delivery position with first (28, 32) and second (29, 33) detector members. The second detector member subsequent to having been operated operates the first or second suction means depending on the first detector member being in its non-operated or operated condition respectively. The vibration damping material comprises two layers of aluminium and lead which have a different thickness and are secured to both sides of an inner layer made of a plastic material.



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SINGLER DEVICE AND VIBRATION DAMPING MATERIAL

The present invention relates to a singler device for flat articles, e.g. letters, including first and second article driving means to engage and drive said flat articles sequentially off a stack located in an input position and sideways
5 therefrom via a passage into a delivery position laterally separated from said input position by lateral guiding means for said flat articles, and article detector means mounted in said delivery position for controlling said driving means.

Such a singler device is already known from
10 US patent 2 970 834. In this known device the first driving means is mounted in the input position close to the guiding means, whereas the second driving means is mounted in the delivery position. These driving means are operated in succession subsequent to the detector means having detected the passage
15 of the trailing edge of a letter.

A drawback of this known device is that due to the first driving means being mounted close to the guiding means comprising a guide plate even a small misalignment with respect to the guide plate between two consecutive letters in the
20 input position may give rise to an erroneous operation. Indeed when for instance the leading edge of two such consecutive letters of the stack are misaligned to such an extent that the second letter instead of the first one is positioned in front of the first driving means the second letter and not the first
25 one will be carried away off the stack when this driving means is operated.

Separate means might be provided to align the

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leading edges of the letters on the guide plate but this requires additional equipment.

An object of the present invention is therefore to provide a singler device of the above type but which does
5 not present this drawback, i.e. wherein the flat articles are separated from the stack in the correct order even when they are misaligned to a certain extent.

According to the invention this object is achieved due to the fact that said singler device is characterized in
10 that said article detector means include first and second detector members, that said first and second driving means are both mounted in said input position, said first and second driving means and said first and second detector members being arranged in succession along the path followed by an article from said input
15 position to said delivery position and that said second detector member subsequent to having been operated operates said first or second driving means depending on said first detector member being in its non-operated or operated condition respectively.

In this way the misalignment between two consecutive
20 articles of the stack may be relatively large before it gives rise to an erroneous operation. More particularly, at the start of a singling operation, i.e. after a stack has been brought in the input position the maximum permissible misalignment is substantially equal to the distance between
25 the first driving means and the guiding means comprising a guide plate. Indeed, when for instance the leading edge of the first of these two articles makes contact with the guide plate, whilst the second article is still positioned in front of the first driving means the latter driving means will be operated,
30 due to the first detector member being inoperative, so that notwithstanding this misalignment the first article will be carried off the stack.

The present invention also relates to a vibration damping material comprising two metal outer layers secured to
35 both sides of an inner layer.

Such a vibration damping material is well known

in the art. It is for instance mentioned in the article "Development of Silentalloy Hidamet" by K. Amano et al, Toshiba Review, No 99, Sept.-Oct. 1975, pp 29-32.

An object of the present invention is to provide
5 an improved vibration damping material of the above type.

According to the invention this object is achieved due to the fact that said two metal layers are layers of aluminium and lead having different thickness respectively, whilst said inner layer is made of a plastic material.

10 The above mentioned and other objects and features of the invention will become more apparent and the invention itself will be best understood by referring to the following description of an embodiment taken in conjunction with the accompanying drawings in which :

15 Fig. 1 is a top view of a singler device according to the present invention, an electric monitoring circuit forming part of this device being however not shown;

Fig. 2 is a cross-section along line II-II of Fig.1;

Fig. 3 schematically shows the electric monitoring
20 circuit according to the present invention;

Figs. 4 and 5 are pulse diagrams to illustrate the operation of the device.

The singler device as shown in Figs. 1 and 2 includes a horizontal bottom plate 1 on which are mounted a
25 vertical lateral guide plate 2 and an L-shaped front plate 3. These plates 2 and 3 have cut-out end portions 4 and 5 respectively. An endless perforated belt 6 runs over rollers 7, 8, 9 and 10 and between parts of the front plate 3 which are disposed in the plane of the belt 6. The guide rollers 7, 8 and 9 are idlers
30 mounted on axles fixed on the bottom plate 1, whilst roller 10 is a drive roller mounted on a shaft 11 of a drive motor (not shown). A feeler 12 of a microswitch is mounted between lower portions of the front plate 3 to which strips 44, 45 made of a friction material are affixed. Suction devices 13 and 14 are
35 secured to the front plate 3 and have suction openings 15 and 16 terminating behind the belt. These suction devices

are for instance diaphragm valves of the type disclosed in British patent 1 225 562 (R. Debackere - W. Mens 5-4). Each of these suction devices is able to create an underpressure or not in its suction opening.

5 The bottom plate 1, the lateral guide plate 2, the front plate 3 and a portion of the belt 6 define an input position 17 for a stack 18 of letters or other flat articles. This stack 18 is urged gently towards the working face of the perforated belt 6, for instance by means of a pusher plate
10 (not shown) such as described and shown in the above mentioned US patent 2 970 834 and aided by three auxiliary feeder belts 41, 42, 43 with their working faces supporting the letters running toward and transversely of the working surface of the suction belt 6. The motor (not shown) driving the feeder belts 41, 42,
15 43 is controlled by the microswitch feeler 12.

 The input position 17 communicates with a delivery position 19 via a passage 20 delimited by the portion of the belt 6 located in front of the cut-out portion 5 of front plate 3 and the end portion of the lateral guide plate 2. A separator
20 21 comprising a freely rotatable vertical piece having a substantially L-shaped cross-section is mounted on the bottom plate 1 and in the cut-out portion 4 of the lateral guide plate 2. By not shown spring means the separator 21 is continuously urged into contact with the portion of the belt 6 located in front of the
25 cut-out portion 5 so as to normally close the above passage 20.

 Considered in the direction of advancement of the belt 6 the separator 21 is followed by a suction chamber 22 wherein an underpressure is continuously created and by a pressure roller 23. The latter roller 23 is an idler roller
30 mounted on a bracket 24 which is able to pivot about axle 25 fixed on bottom plate 1 and connected to a fixed pin 26 through a spring 27 which continuously urges the roller 23 into contact with the belt 6.

 The delivery position 19 also includes two electric
35 detector members each comprising a light emitting diode and a photocell mounted in front of each other above the belt and at

either side thereof. Light emitting diodes 28 and 29 are mounted on brackets 30 and 31 respectively, whilst photocells 32 and 33 are mounted on the supports 34 and 35 respectively.

Finally, the delivery position 19 is followed by
5 a pair of belts 36, 37 carried by rollers 38 and 39, 40 respectively, the belts moving in the direction of the arrows.

Referring to Fig. 3 the electric monitoring circuit shown therein includes :

- bistable circuits K1 and K2 controlling the suction devices
10 13 and 14 respectively;
- monostable circuits MS1 and MS2 with time constants T1 and T2 respectively;
- a differentiator D;
- AND-gates G1, G2, G3 and OR-gates M1 and M2;
- 15 - a start key SK connected to an operating voltage V.

The operation of the above described singler device is described hereinafter by making reference to Figs. 1 to 3 and to Figs. 4 and 5.

Hereby it is supposed that initially no letters
20 are present in the device so that both the photocells 32 and 33 are illuminated by their associated light emitter diodes 28 and 29 respectively as a consequence of which both the inverse outputs $\overline{f1}$ and $\overline{f2}$ of these photocells are activated (or on 1).

After a stack 18 of letters has been put in the
25 input position 17 the start key SK (Fig. 3) is temporarily operated to trigger the monostable circuit MS1 to its unstable condition via the OR-gate M1 and the AND-gate G1 which is enabled due to the inverse output $\overline{f1}$ being activated. After a time interval T1 has elapsed the O-output of the monostable
30 circuit MS1 becomes activated, as a consequence of which the bistable circuit K1 is triggered to its 1-condition wherein it operates the suction device 13 (Fig. 4). This device then exerts a suction in the suction opening 15 so that the suction belt 6 starts moving the terminal letter off the stack 18 sideways
35 from the input position 17 into the delivery position 19 against the action of the friction strips 44, 45. Hereby the leading

edge of this terminal letter is displaced past the separator 21 and in front of the suction chamber 22, both these elements restraining advancement by the belt 6 of all but this terminal letter. Thus, letters which are possibly erroneously displaced
5 with this terminal letter, e.g. due to the fact that they adhere thereto by friction, are substantially prevented from entering the delivery position 19.

When the leading end portion of the terminal letter is detected by the photocell 32 the output f1 thereof becomes
10 activated as a consequence of which the bistable circuit K1 is reset to its 0-condition. Also the suction device 13 then becomes inoperative. However, simultaneously with the bistable circuit K1 being reset the bistable circuit K2 is triggered to its 1-condition via the AND-gate G3 and the OR-gate M2 as the
15 1-output k1 of the bistable circuit K1 is then still activated. Due to this the suction device 14 is then operated so that the perforated belt 6 displaces the above terminal letter further into the delivery position 19 from the suction chamber 22 towards the pressure roller 23.

20 When the leading edge of this letter is detected by the photocell 33 the output f2 thereof becomes activated as a consequence of which the bistable circuit K2 is reset to its 0-condition (Fig. 4). Also the suction device 14 then becomes inoperative. However, at that moment the leading edge of the
25 terminal letter is seized between the pressure roller 23 and the belt 6 and carried further until it is seized between the belts 36 and 37.

Upon the rear edge of the terminal letter leaving the photocell 33 the inverse output $\overline{f2}$ thereof becomes activated
30 so that a trigger pulse is produced at the output of the differentiator D and therefore at the output of the OR-gate M1. As a consequence either the monostable circuit MS1 or the monostable circuit MS2 is triggered to its 1-condition via the AND-gate G1 or G2 depending on the output $\overline{f1}$ or f1 of the
35 photocell 32 being activated at that moment respectively i.e.

on a letter following the above mentioned terminal letter, hereinafter called second letter, being absent or present in front of this photocell 32 respectively.

Normally, no such second letter is located in front of the photocell 32 and in this case the operation is as described above.

On the contrary when such a second letter is located in front of this photocell 32 due to the fact that it has for instance been carried off the stack together with the above mentioned terminal letter, the monostable circuit MS2 is triggered to its unstable condition (Fig. 5). After a time interval T2 has elapsed the 0-output of the monostable circuit MS2 becomes activated as a consequence of which the bistable circuit K2 is triggered to its 1-condition wherein it operates the suction device 14 so that the perforated belt 6 displaces the above second letter further into the delivery position. The rest of the operation is as already described above.

The reason of the above mentioned time intervals T1 and T2 is explained hereinafter. Hereby reference is made to Figs. 4 and 5 wherein the length of the terminal letter corresponds to a time interval TL.

The distance between two consecutive letters, such as the above mentioned terminal letter and second letter, must at least be equal to a minimum value in order that sufficient time should be available to perform other operations, such as for instance the control of a points mechanism. This distance is supposed to correspond to a time interval T, taking the operation speed into account. This means that the time interval elapsing between the moment at which the trailing edge of the terminal letter leaves the photocell 33 and the moment at which the suction device 13 (Fig. 4) or 14 (Fig. 5) is operated to displace the second letter should be such that the leading edge of this second letter comes in front of the photocell 33 after a time interval T.

As described above the suction device 13 is operated when the second letter is not located in front of the photocell 32 at the moment the terminal letter leaves photocell 33. This

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second letter is closest to the photocell 32 when its leading edge is about to come in front of this photocell 32. Supposing that in this case a time interval T_3 (Fig. 4) is required to reach the photocell 33 it is clear that instead of operating
5 the suction device 13 only a time interval T after the trailing edge of the terminal letter has left the photocell 33, in which case the second letter would only reach the photocell after a time interval $T + T_3$, this suction device 13 can already be operated a time interval $T_1 = T - T_3$ after the trailing edge
10 of the terminal letter has left the photocell 33. In this case the second letter will reach the photocell 33 after the minimum time interval T . Thus the operating speed of the device is increased.

As also described above, the suction device 14 is operated when the second letter is located in front of the
15 photocell 32. This letter is closest to the photocell 33 when its leading end portion is about to come in front of the latter photocell e.g. when it is at about 5mm from the photocell 33 which is in line with the point at which the pressure roller 23 makes contact with the belt 6. Because in this case a time
20 interval T_4 is required to reach the photocell 33 it is clear that when the suction device 14 is operated a time interval $T_2 = T - T_4$ after the trailing edge of the terminal letter has left the photocell 33 the second letter will again reach the photocell 33 after the minimum time interval T has elapsed.

25 The minimum letter length able to be correctly processed is considered hereinafter.

As described above, if the second letter is not located in front of the photocell 32 at the moment the trailing edge of the terminal letter leaves the photocell 33 the second
30 letter will be advanced, a time interval T_1 later, by the cooperation of the belt 6 and the suction device 13. This means that at the moment the leading edge of this second letter is in front of the photocell 32 the trailing edge of this letter should still be completely in front of the suction device 13
35 in order to prevent a third letter following the second letter to be displaced by this suction device. Hence, the minimum

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letter length able to be processed by the present device is substantially equal to the distance separating the suction device 13 and the photocell 32.

Similarly and as also described above, if the
5 second letter is located in front of the photocell 32 at the moment the trailing edge of the terminal letter leaves the photocell 33 the second letter will be advanced, a time interval T_2 later, by the cooperation of the belt 6 and the suction device 14. This means that at the moment the leading edge of
10 this second letter is in front of the photocell 33 the trailing edge of this letter should still be completely in front of the suction device 14 in order to prevent a third letter following the second one to be displaced by this suction device. Hence, the minimum letter length able to be processed by the present
15 device is also substantially equal to the distance between the trailing end portion of the suction device 14 and the photocell 33.

The choice of the relative position of the suction devices 13, 14 and of the photocells 32, 33 will be explained
20 hereinafter.

At the start of an operation the maximum permissible misalignment of the front edges of the letters of the stack 18 is equal to the distance between the leading edge of the suction device 13 and the guide plate 2 because when the leading edge
25 of a first letter coincides with the leading edge of the suction device 13 and the leading edge of the second letter following the first one makes contact with the guide plate the suction device 13 will be operated because no letter is situated in front of the photocell 32, so that - as it should be - the first
30 letter will be carried off the stack 18 by the belt 6. On the contrary, if the misalignment is larger the second letter instead of the first one will be displaced from the input position towards the delivery position 19. It is clear that to have the maximum permissible misalignment at the start of
35 an operation the distance between the suction device 13 and the guide plate 2 should be a maximum i.e. the plate 2 should

be mounted as close to the photocell 32 as possible. However, the distance between the guide plate 2 and the photocell 32 should be sufficient to mount the separator 21 and the suction chamber 22 so that this limits the maximum permissible alignment.

5 During operation the maximum permissible misalignment of the front end portions of the letters of the stacks 18 is somewhat smaller than that at the start of an operation because of the space required by the suction device 14. Indeed, this misalignment is equal to the distance between the leading edge
10 of the suction device 14 and the photocell 32 because when the leading edge of a first letter coincides with the leading edge of the suction device 14 and the leading edge of the second letter following the first one is situated in front of the photocell 32 the suction device 14 will be operated, so that - as it should
15 be- the first letter will be carried off the stack by the belt 6. On the contrary, if the misalignment is larger the second letter instead of the first will be displaced towards the delivery position 19.

It is clear that to have the maximum permissible misalignment
20 during operation the distance between the suction device 14 and the photocell 32 should be a maximum i.e. the suction device 14 should be as close as possible to suction device 13. But since the distance between the suction device 14 and the photocell 33 is equal to the minimum letter length this means that the
25 photocell 33 should also be as close as possible to the photocell 32. However between the photocells 32 and 33 sufficient room should be provided to mount the elements 21, 22 and 23.

Since vibrations introduced by the driving mechanism and particularly the rollers can create excessive noise, it is
30 desirable to reduce them by making the bottom plate 1 out of a suitable vibration damping material. The following sandwich material composition comprising two metal layers enclosing a layer of organic material produced adequate results :

- 3 to 10 millimeters, e.g. 10 millimeters of aluminium;
- 35 - 1 to 3 millimeters, e.g. 1 millimeter, of lead;
- 0.2 to 2 millimeters, e.g. 0.5 millimeter of soft

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polyvinylchloride.

Soft polyvinylchloride has a hardness between 60 and 80 Shore A.

While the principles of the invention have been
5 described above in connection with specific apparatus, it is
to be clearly understood that this description is made only by
way of example and not as a limitation on the scope of the
invention.

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Patent claims

1. Singler device for flat articles, e.g. letters, including first and second article driving means to engage and drive said flat articles sequentially off a stack located in an input position and sideways therefrom via a passage into
5 a delivery position laterally separated from said input position by lateral guiding means for said flat articles, and article detector means mounted in said delivery position for controlling said driving means, characterized in that said article detector means include first (28, 32) and second (29, 33) detector members,
10 that said first (13) and second (14) driving means are both mounted in said input position (17), said first (13) and second (14) driving means and said first (28, 32) and second (29, 33) detector members being arranged in succession along the path followed by an article from said input position (17) to said
15 delivery position (19) and that said second detector member (29, 33) subsequent to having been operated operates said first (13) or second (14) driving means depending on said first detector member (28, 32) being in its non-operated or operated condition respectively.
- 20 2. Singler device according to claim 1, characterized in that said first and second driving means comprise first (13) and second (14) stationary suction means mounted along one face of a traveling suction belt (6) and operable to cause suction engagement of the flat articles from said stack (18) by said
25 belt (6), said passage (20) being provided between said belt (6) and said lateral guiding means (2).
3. Singler device according to claim 1, characterized in that in case said first suction means (13) is

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operated subsequent to said passage of said trailing edge of said first flat article in front of said second detector member (29, 33), said first suction means (13) is de-activated and said second suction means (14) is activated upon said first detecting member (28, 33) afterwards detecting the presence of said second flat article in front of it and said second suction means (14) is finally de-activated upon said second detector member (29, 33) detecting the passage of the leading edge of said second flat article.

10 4. Singler device according to claim 1, characterized in that in case said second suction means (14) is operated subsequent to said passage of said trailing edge of said first flat article in front of said second detector member (29, 33), said second suction means (14) is finally de-activated
15 upon said second detector member (29, 33) detecting the passage of the leading edge of said second flat article.

 5. Singler device according to claim 1, characterized in that the distance between said first suction means (13) and said first detector member (28, 32) is substantially
20 equal to the minimum length of the flat articles of said stack.

 6. Singler device according to claim 1, characterized in that the distance between said second suction means (14) and said second detector member (29, 33) is substantially equal to the minimum length of the flat articles of said stack.

25 7. Singler device according to claim 1, characterized in that said first suction means (13) is activated following the detection by said second detector member (29, 33) of the trailing edge of said first article after a first time interval substantially equal to the difference between a
30 predetermined minimum time interval (T) corresponding to a minimum distance between said first and second articles and the time interval (T3) necessitated to transport said second article from said first detector member (28, 32) to said second detector member (29, 33).

35 8. Singler device according to claim 1, characterized in that said second suction means (14) is activated

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following the detection by said second detector member (29, 33) of the trailing edge of said first article after a second time interval (T2) substantially equal to the difference between a predetermined minimum time interval (T) corresponding to a
5 minimum distance between said first and second articles and the time interval necessitated to transport said second article from just before said first detector member (28, 32) to in front of this member.

9. Singler device according to claim 2,
10 characterized in that it includes a separator (21) cooperative with the belt (6) in said delivery position (19) in a manner restraining advancement by the belt of all but the terminal flat article of the stack.

10. Singler device according to claim 2,
15 characterized in that it includes a third stationary suction means (22) mounted along the other face of said belt in said delivery position (19) and operable in a manner restraining advancement by the belt of all but the terminal flat article.

11. Singler device according to claim 2,
20 characterized in that it includes a pressure roller (23) mounted in said delivery position (19) and cooperative with the belt (6) to grip and advance the leading edge of a flat article detected by said second detector member (29, 33).

12. Vibration damping material comprising two metal
25 outer layers secured to both sides of an inner layer, characterized in that said two metal layers are layers of aluminium and lead having different thickness respectively, whilst said inner layer is made of a plastic material.

13. Vibration damping material according to
30 claim 12, characterized in that said plastic material is a soft plastic material.

14. Vibration damping material according to
claim 13, characterized in that said soft plastic material is a soft polyvinylchloride having a hardness between 60 and 80
35 Shore A.

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15. Vibration damping material according to claim
14, characterized in that said first thickness is between 3
and 10 millimeter, said third thickness is between 1 and 3
millimeter and the thickness of said soft polyvinylchloride
5 is between 0.2 and 2 millimeter.

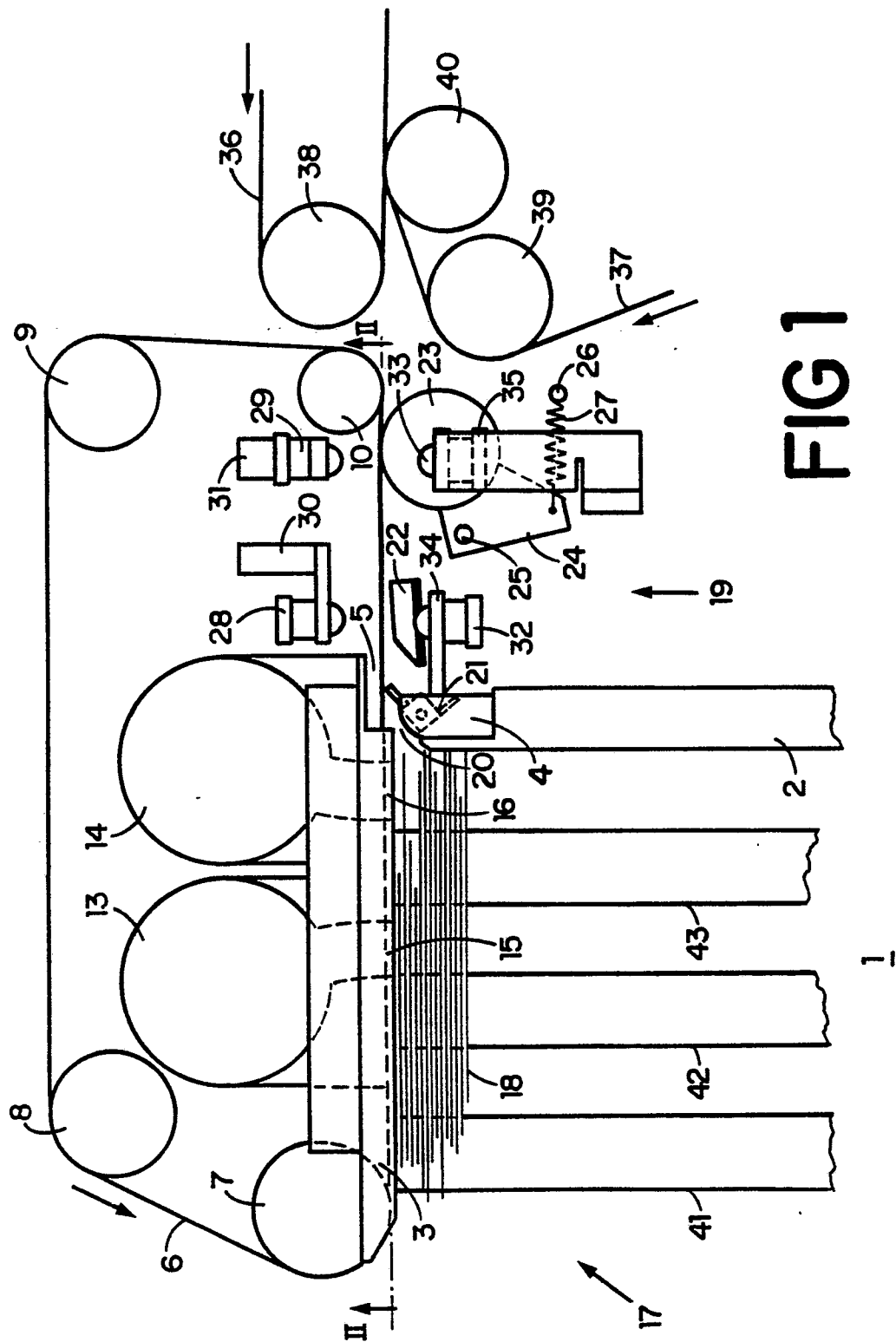


FIG 1

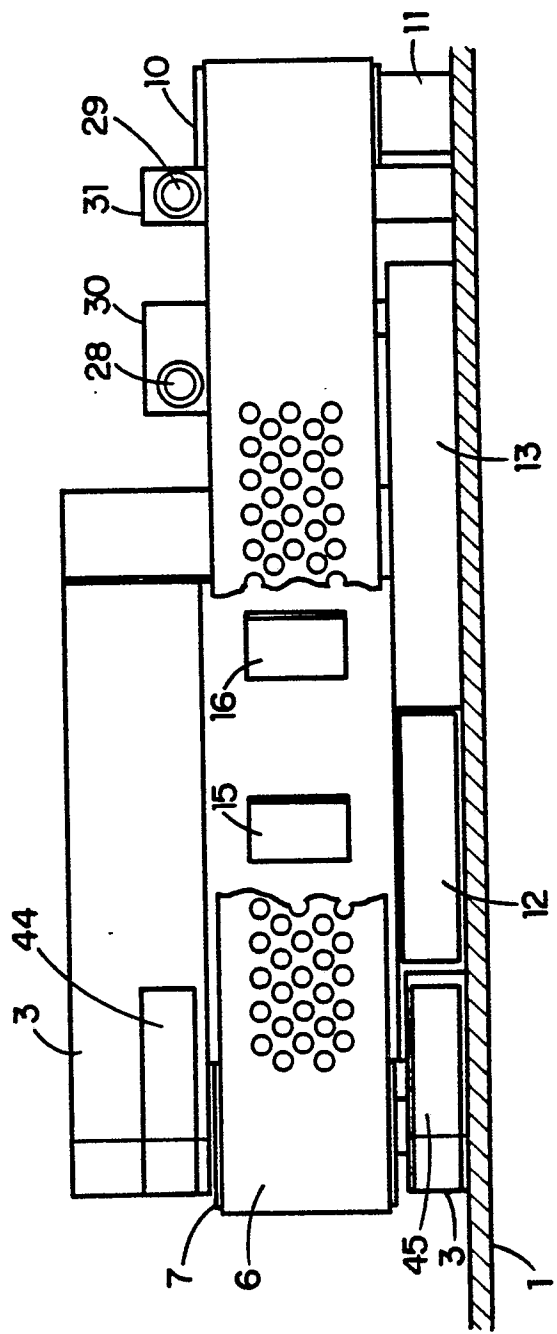


FIG 2

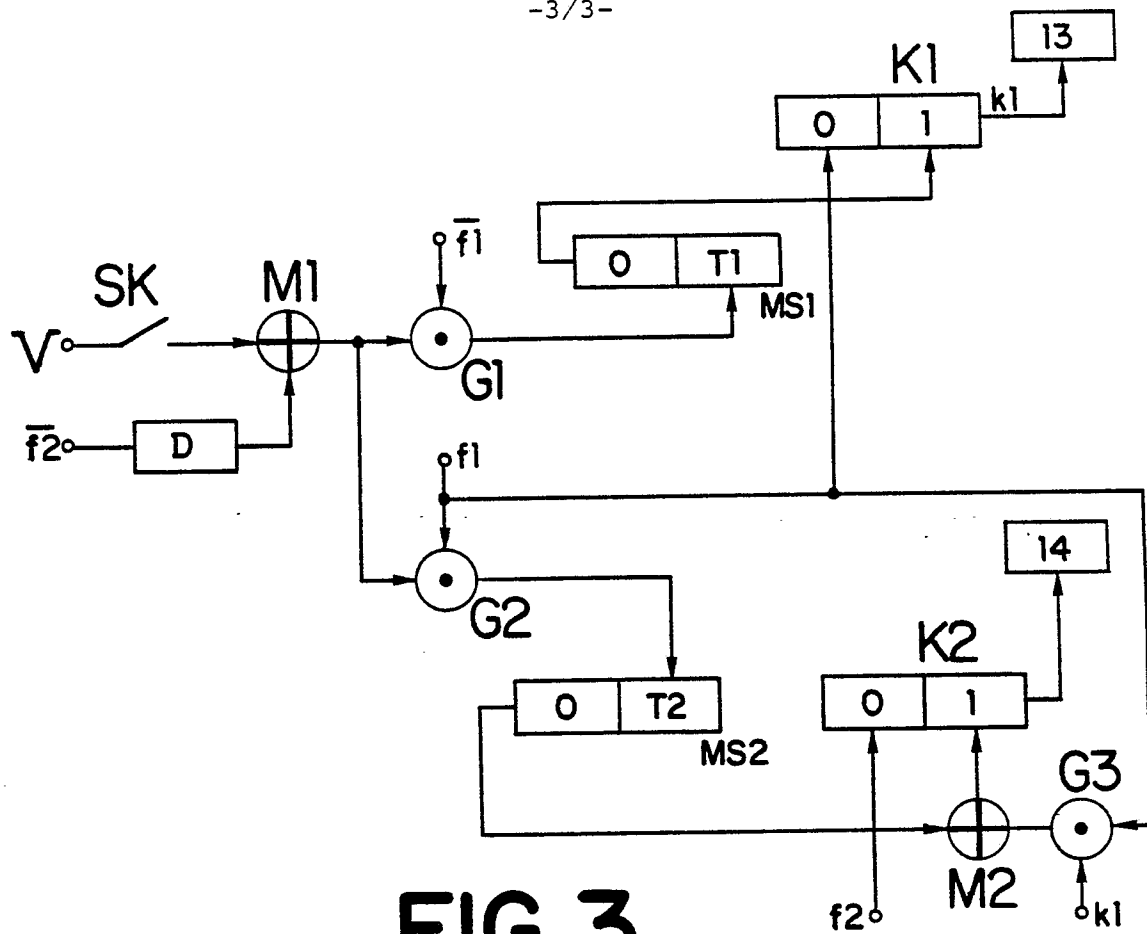


FIG 3

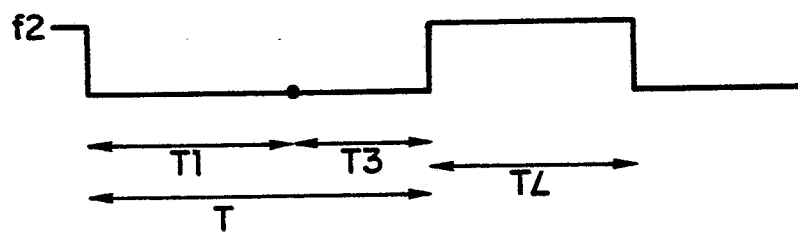


FIG 4

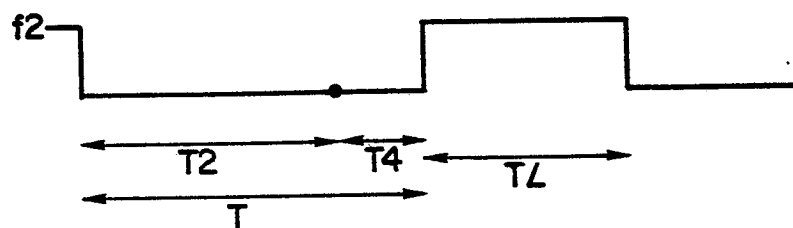


FIG 5