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(54) **FEEDING FLEXIBLE PRODUCTS**

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(57) **ABSTRACT**

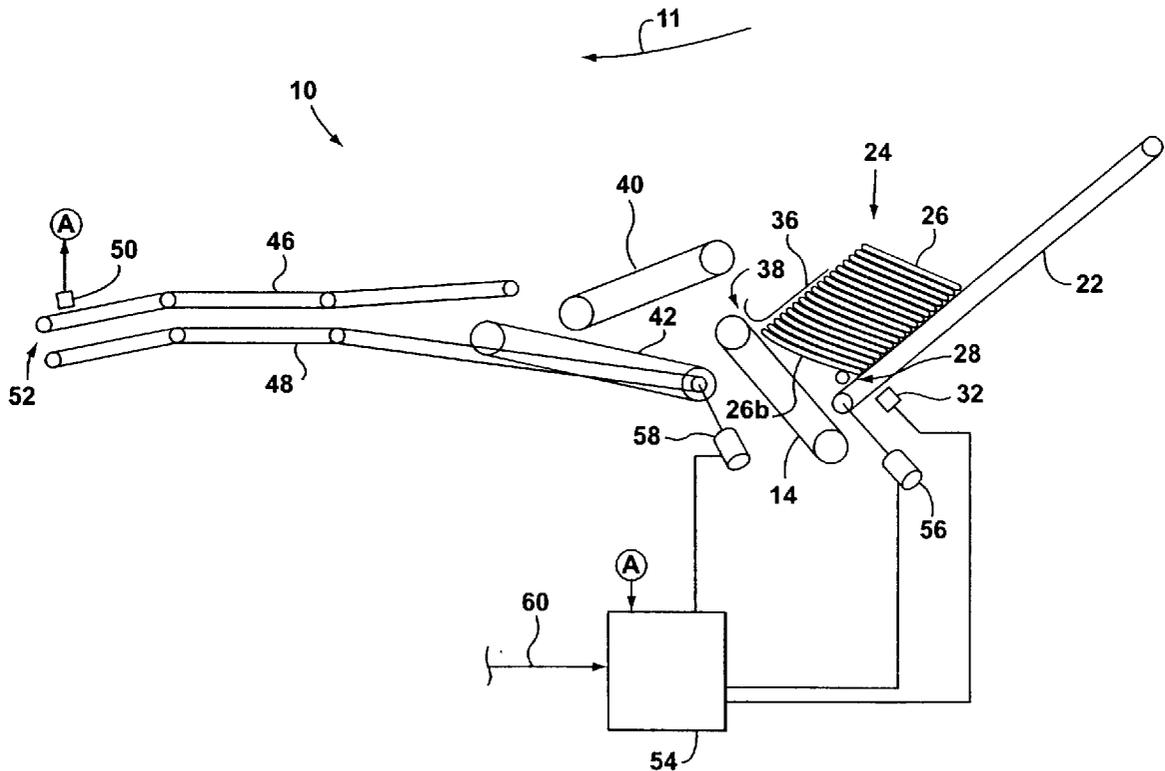
A stack of pouches (or other flexible products) is supported such that the stack declines from the horizontal. A pouch at the base of the stack can then be pulled upwardly from the base of the stack. This may be accomplished with an inclined conveyor on which the base of the stack rests. Because the basal pouch is pulled upwardly, gravity assists in ensuring that none of the other pouches in the stack follow the basal pouch. Thus, the approach assists in ensuring single pouch feeding.

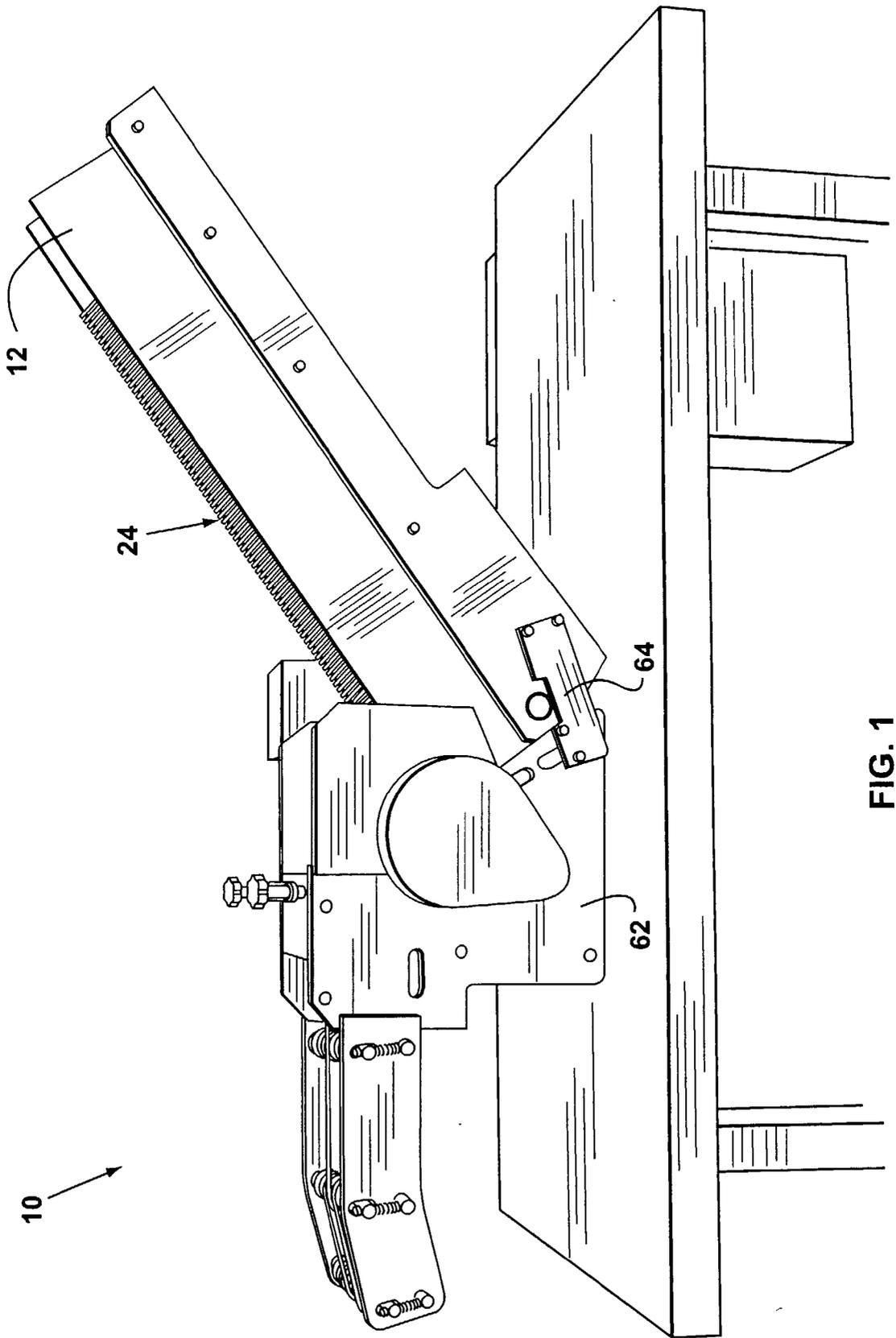
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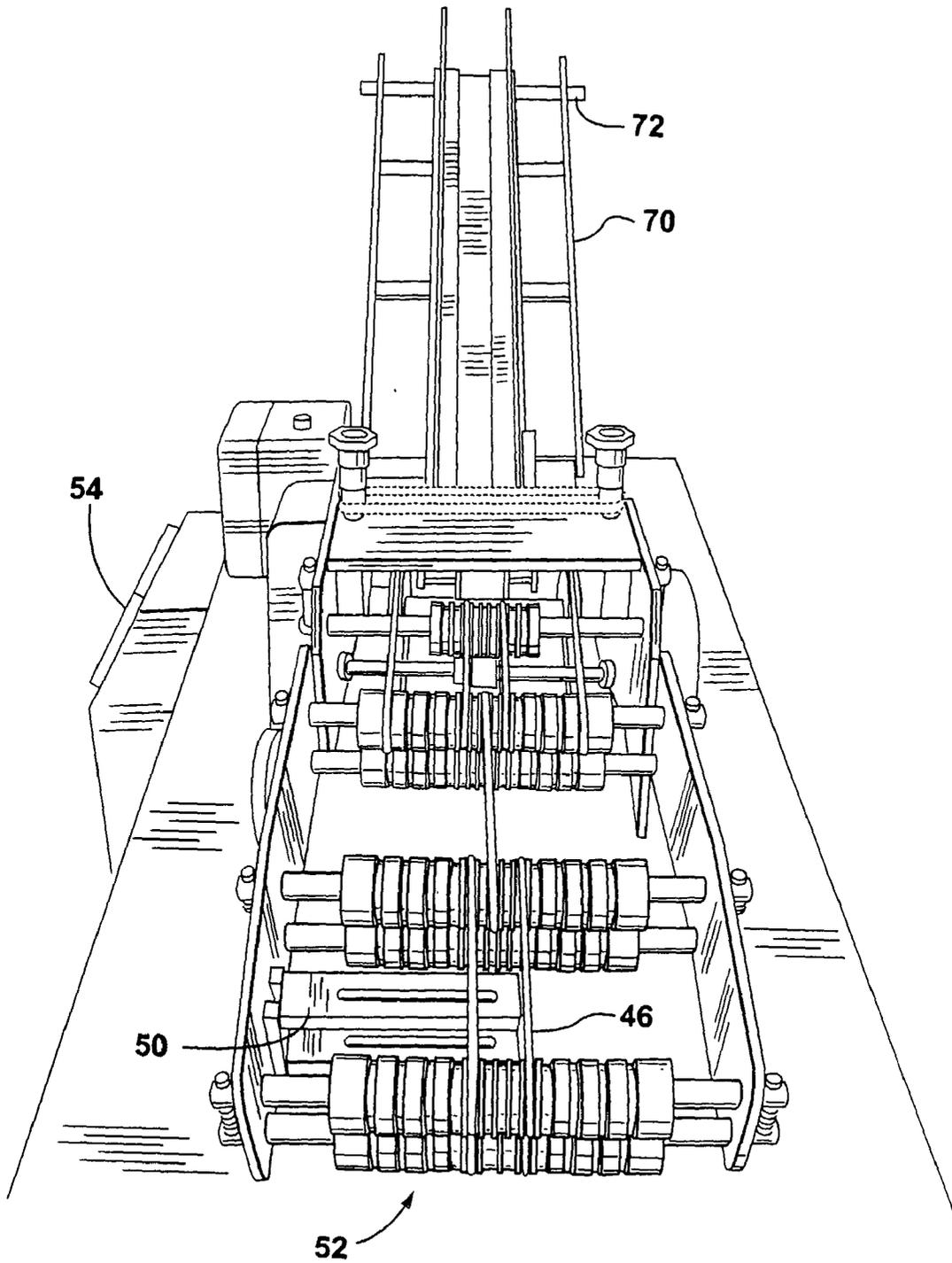
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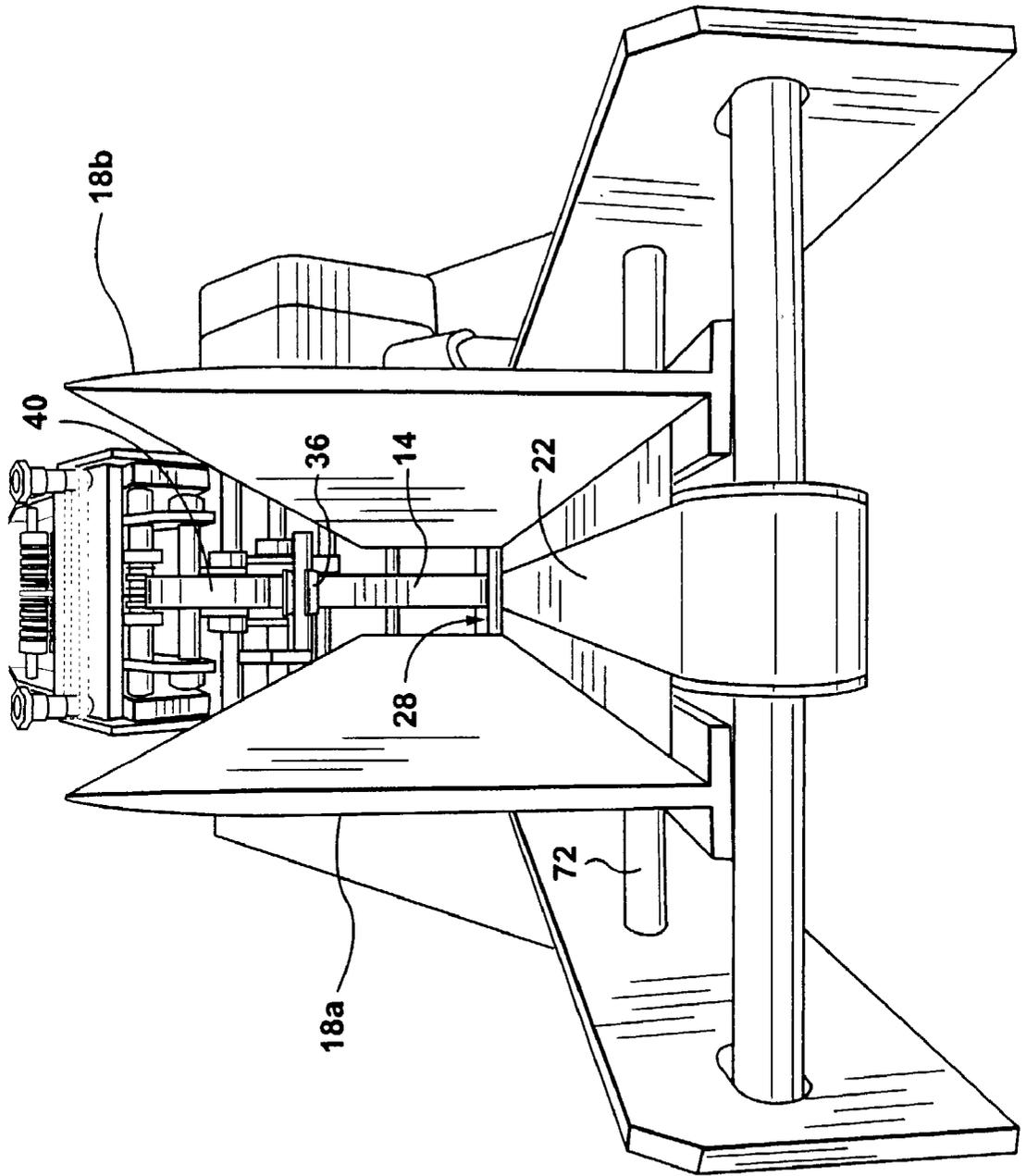




**FIG. 1**



**FIG. 2**



**FIG. 3**





## FEEDING FLEXIBLE PRODUCTS

### BACKGROUND OF THE INVENTION

[0001] This invention relates to feeding flexible products, such as pouches.

[0002] Pouches are used to package a wide variety of products such as spices and other dry powdered products, seeds, sterile medical supplies, sample sizes of shampoo, and individual servings of condiments. It may be desired to dispense pouches into an assembly line as, for example, when a pouch is to be inserted into a box or envelope. By virtue of their flexible nature and variable thickness, it is difficult to feed pouches one at a time in automated processes. U.S. Pat. No. 5,239,809 to Long issued Aug. 31, 1993 addresses this issue by feeding pouches incorporated into a web to a dispensing area where individual pouches are guillotined from the web. A drawback with this approach is that the guillotine may occasionally sever a pouch. When this occurs, the contents of the pouch may spill, fouling the equipment. Furthermore, this approach requires manufacturing the pouches in a web.

[0003] Therefore, a need remains for an approach to feeding pouches and other flexible products which avoids the identified drawbacks.

### SUMMARY OF THE INVENTION

[0004] A stack of pouches (or other flexible products) is supported such that the stack declines from the horizontal. A pouch at the base of the stack can then be pulled upwardly from the base of the stack. This may be accomplished with an inclined conveyor on which the base of the stack rests. Because the basal pouch is pulled upwardly, gravity assists in ensuring that none of the other pouches in the stack follow the basal pouch. Thus, the approach assists in ensuring single pouch feeding.

[0005] According to the present invention, there is provided a flexible product feeder, comprising: an inclined conveyor; a product stack support declining toward said inclined conveyor for supporting a product stack such that a product at a base of said stack rests on said inclined conveyor; a motor for moving said conveyor so as to urge any product resting thereon upwardly.

[0006] According to another aspect of the invention, there is provided a pouch feeder, comprising: an inclined conveyor; a pouch stack support declining toward said inclined conveyor for supporting a pouch stack such that a pouch at a base of said stack rests on said inclined conveyor; a motor for moving said conveyor so as to urge any pouch resting thereon upwardly.

[0007] According to a further aspect of the invention, there is provided a method for feeding flexible products, comprising: supporting a stack of products such that said stack declines from the horizontal; feeding a basal product from a base of said stack by pulling said basal product upwardly.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0008] In the figures which illustrate example embodiments of the invention,

[0009] FIG. 1 is a side view of a feeder made in accordance with this invention,

[0010] FIG. 2 is a top perspective view of the feeder of FIG. 1 shown from a dispensing end,

[0011] FIG. 3 is a top perspective view of an input end of the feeder of FIG. 1,

[0012] FIG. 4 is a schematic view of the feeder of FIG. 1 shown in a condition at start up, and

[0013] FIG. 5 is another schematic view, similar to that of FIG. 4 but shown in a condition ready for dispensing.

### DETAILED DESCRIPTION

[0014] Turning to the figures, a feeder 10 feeds pouches 26 in a downstream direction 11 from a pouch stack support 12. The pouch stack support declines to an inclined conveyor 14 which, in the illustrated embodiment, is an endless friction belt. The pouch stack support 16 comprises sidewalls 18a, 18b each with an inwardly directed flange 20a, 20b, respectively, that form a gapped floor of the pouch stack support. The gap between the flanges accommodates an urging conveyor 22 which, in the example embodiment, is an endless friction belt. A stack 24 of pouches 26 is supported by the pouch stack support 12 such that a pouch 26b at the base of the stack 24 rests on the inclined conveyor. However, an abutment 28 which, in the example embodiment, is a bar extending between the sidewalls 18a, 18b of the pouch stack support 12, is positioned proximate the inclined conveyor 14 and urging conveyor 22 to space the lower end of pouch 26a from the inclined conveyor 14. A sensor 32 is positioned adjacent, but upstream of, the bar to sense the lower end of pouch 26b. (In the schematic views, this sensor 32 is shown below urging conveyor 22. In reality, a hole will be provided through a sidewall of the pouch stack support 12 to allow the sensor a "view" adjacent the bar.)

[0015] A curved plate 36 has a flat upstream portion extending over the stack 24 of pouches and a curved downstream portion that forms a nip 38 at the upper end of the inclined conveyor 14.

[0016] An overhead conveyor 40 is positioned overhead of the inclined conveyor 14 and an underlying conveyor 42 underlies the overhead conveyor 40. In the example embodiment, both of these feeders are endless belts.

[0017] Conveyors 40, 42 feed to co-operating downstream conveyors 46, 48 which, in the illustrative embodiment, are endless bands. A pouch sensor 50 is positioned at the dispensing end 52 of the feeder 10.

[0018] The sensors 32 and 50 output to a processor 54. A motor 56 is provided for driving urging conveyor 22 and is operatively coupled to processor 54. A second motor 58 is provided for driving each of conveyors 14, 40, 42, 46, and 48. Motor 58 is also operatively coupled to processor 54. Appropriate gearing (not shown) is provided between the conveyors 14, 40, 42, 46, and 48 such that conveyors 40, 42, 46, and 48 operate at a speed greater than that of conveyor 14. Processor 54 receives pouch demand signals on line 60.

[0019] A base 62 of the feeder has an arm 64 that allows for the adjustment of the declination angle of the pouch stack support 12. Normally, the product stack support 12 will be adjusted to decline from the horizontal at an angle of

between about twenty to forty degrees and will make an inside angle with the inclined conveyor **14** of between about eighty and one hundred degrees. At a typical declination of about thirty degrees from the horizontal, the product stack support **12** makes an inside angle with the inclined conveyor **14** of about ninety degrees.

[0020] Preparatory to operation, the pouch stack support **12** of feeder **10** may be loaded with a stack **24** of pouches. Whenever feeder **10** is activated, if sensor **32** is not blocked (i.e., it does not sense a lower end of a pouch **26b**), processor **54** causes motor **56** to operate at a slow speed to slowly move urging conveyor **22** in downstream direction **11**. This urges the lower ends of the pouches **26** downwardly toward inclined conveyor **14**. The sensor **32** is positioned such that it will become blocked (i.e., will sense a lower end of pouch **26b**) when the pouch **26a** at the base of the stack **24** abuts abutment **28**. Whenever sensor **32** becomes blocked, urging conveyor **22** is stopped.

[0021] The processor **54** may then be prompted by a user to operate the feeder to achieve a dispensing ready position (illustrated in **FIG. 5**). This causes the processor to activate motor **58**.

[0022] With motor **58** running, the inclined conveyor **14** urges basal pouch **26b** upwardly. With the inclined conveyor fabricated of a friction enhancing material and with the majority of the bottom face of the basal pouch **26b** lying against the inclined conveyor, the frictional engagement of the inclined conveyor will, for most pouch types, be sufficient to overcome the frictional engagement of the basal pouch with the remainder of the pouch stack **24**. Thus, the inclined conveyor will cause the basal pouch **26b** to move upwardly. Further in this regard, it will be noted that the frictional engagement of the basal pouch **26b** with the rest of the stack is a function of the maximum height of the stack and of the angle of declination of the pouch stack support **12**. However, the frictional engagement of the basal pouch **26b** with the inclined conveyor is also a function of these variables. Thus, a pouch may be pulled from the stack by the inclined conveyor relatively independently of these variables. The key, however, is that the pouch stack decline to the inclined conveyor so that the basal pouch **26b** may be pulled upwardly. In consequence of this, gravity will assist in ensuring that only the basal pouch is fed upwardly, thus helping to avoid improper feeding of more than one pouch at a time.

[0023] As soon as pouch **26b** clears abutment **28**, the lower end of the pouch will fall onto conveyor **14**. However, it will be noted that the lower end of the next adjacent pouch is kept spaced from the inclined conveyor so that, at this stage, no portion of this next adjacent pouch touches the inclined conveyor. With the basal pouch **26b** no longer upstream of abutment **28** sensor **32** may become unblocked. This results in re-activation of motor **56** to urge the bottom end of the next adjacent pouch against abutment **28**.

[0024] As shown in **FIG. 5**, as a pouch **26b** moves upwardly, it enters the nip **38** between the inclined conveyor **14** and curved plate **36**. The nip ensures a strong frictional engagement of the basal pouch with the inclined conveyor as the weight of the stack **24** ceases to provide this frictional engagement due to the basal pouch moving away from the stack. Additionally, the curved plate **36** will tend to block any pouch that might initially move with the basal pouch.

[0025] As pouch **26b** continues to move upwardly, its upper end will hit overlying conveyor **40**. This will cause the (flexible) pouch to be re-directed, that is, it will bend in a downstream direction. As pouch continues to feed, it will leave nip **38** and drop onto underlying conveyor **42**. The pouch will then continue along conveyors **46**, **48**. Once pouch **26b** leaves the base of the stack **24**, the next adjacent pouch becomes the new basal pouch and, with motor **58** continuing to operate, the inclined conveyor will next urge that pouch to feed in a downstream direction. However, because the conveyors **40**, **42**, **46**, and **48** operate at a higher speed than does inclined conveyor **14**, once a pouch leaves nip **38**, it will move ahead of the next pouch that begins feeding through the nip.

[0026] By virtue of this operation, a plurality of pouches will be fed, one at a time, toward the dispensing end **52** of the feeder **10**. As soon as the first fed pouch interrupts sensor **50**, the sensor signals processor **54** which stops motor **58**. Consequently, (apart from possible continued operation of the urging conveyor), the feeder **10** stops in a quiescent, ready to feed, condition illustrated in **FIG. 5**.

[0027] Now when the processor **54** receives a signal on demand line **60**, it re-activates motor **58** until sensor **50** is again interrupted. The result is that one pouch is dispensed (from dispensing end **52**) and the next upstream pouch is moved to a ready position at the dispensing end of the feeder. Operation can then continue in this way with the feeder dispensing one pouch each time the processor receives a signal on demand line **60**.

[0028] The nip **38** will squeeze a pouch which may cause its contents to be re-distributed in the pouch. To reduce this effect (and thus help ensure the pouch is not burst by the nip), the curved plate **36** that forms the nip may have a width which is less than the width of the pouch. Also, the pressure of the nip may be adjusted, as required.

[0029] The sidewalls **18a**, **18b** are supported in a frame **70** by rods **72** so that the sidewall spacing may be adjusted to accommodate pouches of different widths. Additionally, the height of the curved plate **36** above urging conveyor **22** may be adjusted so as to accommodate pouches of different lengths.

[0030] While the feeder **10** has been described in conjunction with the feeding of pouches, it may equally be used in the feeding of other flexible products, such as paper stock.

[0031] While the conveyors **40**, **42**, **46**, and **48** has been described as being geared to inclined conveyor **14** so as to convey more quickly than the inclined conveyor, the same operation will result if the conveyors **40**, **42**, **46**, and **48** are run off a separate motor.

[0032] While sensor **32** is illustrated as feeding back to processor **54**, it could equally feed an operational signal directly to motor **56**. In a similar fashion, sensor **50** could feed an operational signal directly to motor **58**. In such case, demand line **60** could also feed an operational signal directly to motor **56**.

[0033] The curved downstream portion of curved plate **36** could be replaced with a nip wheel which forms nip **38** with inclined conveyor **14**, and, in many situations, the flat upstream portion of the curved plate could be omitted.

[0034] Other modifications will be apparent to those skilled in the art and, therefore, the invention is defined in the claims.

What is claimed is:

1. A flexible product feeder, comprising:
  - an inclined conveyor;
  - a product stack support declining toward said inclined conveyor for supporting a product stack such that a product at a base of said stack rests on said inclined conveyor;
  - a motor for moving said conveyor so as to urge any product resting thereon upwardly.
2. The feeder of claim 1 wherein said product stack support comprises an urging conveyor for urging a lower end of products in a product stack toward said inclined conveyor.
3. The feeder of claim 2 further comprising a sensor proximate said inclined conveyor for sensing a lower end of a product at a base of a stack of products supported by said product stack support, said urging conveyor for operating when said sensor fails to sense a lower end of a product at a base of a stack of products supported by said product stack support.
4. The feeder of claim 3 further comprising an abutment positioned for spacing a lower end of a product at a base of a product stack supported by said product stack support from said inclined conveyor.
5. The feeder of claim 4 further comprising a nip at an upper end of said inclined conveyor for nipping products fed upwardly on said inclined conveyor.
6. The feeder of claim 5 further comprising an overhead belt conveyor overhead of said inclined conveyor for re-directing products fed by said inclined conveyor.
7. The feeder of claim 5 further comprising an underlying conveyor underlying said overhead conveyor.
8. The feeder of claim 7 further comprising means for driving said overhead conveyor and underlying conveyor in a downstream direction at a speed greater than a speed of said inclined conveyor.
9. The feeder of claim 2 wherein said urging conveyor is accommodated in a gapped floor of said product stack support.

10. The feeder of claim 9 further comprising a base for said product stack support which allows adjustment of an angle of declination of said product stack support.

11. The feeder of claim 1 wherein said product stack support makes an inside angle with said inclined conveyor of about ninety degrees.

12. The feeder of claim 1 wherein said product stack support declines from the horizontal at an angle of between twenty to forty degrees and makes an inside angle with said inclined conveyor of between about eighty and one hundred degrees.

13. The feeder of claim 10 wherein said inclined conveyor comprises a friction belt.

14. The feeder of claim 13 wherein said urging conveyor comprises a friction belt.

15. The feeder of claim 4 further comprising a member for blocking from upward feeding all but a product lying against said inclined conveyor.

16. A pouch feeder, comprising:

an inclined conveyor;

a pouch stack support declining toward said inclined conveyor for supporting a pouch stack such that a pouch at a base of said stack rests on said inclined conveyor;

a motor for moving said conveyor so as to urge any pouch resting thereon upwardly.

17. A method for feeding flexible products, comprising: supporting a stack of products such that said stack declines from the horizontal;

feeding a basal product from a base of said stack by pulling said basal product upwardly.

18. The method of claim 17 wherein said basal product is pulled upwardly at approximately a right angle to said stack.

19. The method of claim 18 wherein said feeding comprises operating an upwardly inclined conveyor against which said basal product rests.

20. The method of claim 19 further comprising re-directing flexible products pulled upwardly by said inclined conveyor with an overhead belt conveyor.

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