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(54) Film drive unit.

(57) A film drive unit for a packaging machine, the film drive unit has two endless belts which are driven by a stepping motor so that the bag material is driven at a predetermined velocity when the bag material is being sealed to form discrete bags.

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FILM DRIVE UNIT

The present invention relates to packaging machinery and more particularly but not exclusively to a film drive for a packaging machine.

In the packaging of product which comprises a plurality of discrete units, it is common for a tubular bag material to be formed from sheet material, and the tubular bag material delivered to a filling head whereat the product is delivered to the interior of the tube material. The tube material is subsequently sealed at spaced intervals and discrete bags severed from the tubular material. The sheet material generally comprises a plastic film which is sealed by heat or other means to form the tubular material. The tube material is also sealed transverse of its longitudinal direction of extension, so as to form the discrete bag. This sealed area is also severed by a knife so that the discrete bags are separated from the tubular material. In conventional packaging machines, the speed of the film through the machine determines the period of time to which the plastic film is exposed to the sealing heads which form the discrete bags. In order for correct sealing to take place, the temperature of the sealing heads must be adjusted to match the speed of the film material so that proper sealing does take place.

More particularly, as the film speed increases the temperature of sealing must also increase since sealing must take place over a shorter interval of time, during which the sealing heads are in contact with the plastic film. It is a disadvantage of these known packaging machines, that it is difficult to adjust the temperature to the duration of time during which the sealing heads are in contact with the plastic film. If the adjustment is incorrect, incorrect sealing takes place with the result that the end product is defective.

A still further disadvantage in these previous machines is that their operation is intermittent, and accordingly slow.

It is the object of the present invention to overcome or substantially ameliorate the above disadvantages.

There is disclosed herein a film drive unit of a packaging machine using film sheet to form tubular bag material into which a product is delivered, said machine further having sealing heads which intermittently engage the tubular bag material to form discrete bags; said film drive unit being operable on a continuous basis by comprising, a pair of endless belts having generally parallel co-extensive portions engaging said bag material to move same through said machine, motor means drivingly attached to said endless belts to drive same so that said belt portions have the same velocities and are moving in the same direction, and control means to control said motor means to govern the speed of said endless belts so that said sealing means is engaged with said bag material for a predetermined fixed period of time.

There is further disclosed herein a method of continuously driving a film material through a packaging machine, said machine having means to supply sheet film material, means to form the film material into a tubular bag material, and sealing means to intermittently engage said bag material to sealingly close predetermined length of said bag material to form discrete bags containing product delivered to the interior of said bag material;

said method comprising the steps of driving said bag material at a predetermined velocity while said sealing means engages said bag material, and then accelerating or deaccelerating said bag material to determine the production rate of said machine.

A preferred form of the present invention will now be described by way of example with reference to the accompanying drawings wherein:

Figure 1 is a schematic perspective view of a film drive unit for a packaging machine; and

Figure 2 comprises three graphs which schematically depict film velocities for film being driven through a packaging machine by the drive unit of Figure 1.

Figure 3 is a schematic perspective view of a modification of the drive unit of Figure 1; and

Figure 4 is a schematic sectioned end view of the sealing assembly of the units of Figures 1 and 3.

In Figure 1 there is schematically depicted a drive unit 10 of a packaging machine which unit 10 is operable on a continuous basis. The packaging machine includes means to deliver sheet film material 11 to a former 12 which forms the sheet material 11 into a tubular configuration. The tubular material is moved through the packaging machine by a pair of endless belts 13 which are provided with a plurality of holes 14 which face the tubular material. Located at the rear of the belt 13 is a plennum chamber 15 to which there is delivered a vacuum by means of conduit 16. The chamber 15 is open to an inside surface of the belt 13 so that the vacuum is applied to the holes 14 so that the tubular material is held against the belts 13. The belts 13 pass around rollers 17 of which two at least are driven. For example, the rollers 17 could each be driven by a shaft 18 coupled to a worm drive unit 19. The drive unit 19 would be connected to an electric motor which would be controlled to vary the peripheral speed of the belt 13. The motor could be a stepping, servo, computer controlled or any other motor having suitable control characteristics.

The speed of the belt 13 would be controlled so that the tubular material delivered to the sealing heads would be travelling at a predetermined velocity so that the sealing heads are in contact with the tubular material for a set period of time. Thereafter, the motors would increase the speed of the endless belts 13 to increase the production rate of the packaging machine or alternatively decrease the speed of the tubular material, to achieve a decrease in the output of the packaging machine. Accordingly, the speed of the endless belt 13 may be adjusted to accommodate different products and/or sheet packaging material 11.

In Figure 2 there is schematically depicted three graphs which illustrate typical velocity profiles of the endless belts 13. For example, in graph A, the period of time D is the period during which the sealing heads are in contact with the tubular film material. Thereafter, the speed of the film is decreased and subsequently increased. In the graph B, again the period of time D is the same, and the speed of the film is only slightly decreased. In the graph C, again the period of the interval D is the same with the speed of the film increased after the period D to increase the production rate of the machine. With the period of time D constant, the velocity is also held constant for that time.

Turning now to Figure 3 wherein the film drive unit 10 is depicted with a modification. In this particular embodiment, a drive roller 21 is provided around which the film 11 passes. The film 11 also passes around an idler roller 23 and is sandwiched between the film drive roller 21 and a further idler roller 22. The roller 21 is attached to a servo motor 22 which determines the velocity of the film 11 as required. For example, the servo motor 22 could be driven so as to provide the velocity profile of any one of the velocity profiles depicted in Figure 2. However, it is necessary to drive the shafts 18 via constant torque motors which will thus accordingly adjust their speed in a slavish manner to the speed of the roller

21.

Turning now to Figure 4, wherein the tubular material 24 is more fully depicted relative to a backing bar 20 as provided in Figures 1 and 3. The tubular material 24 overlaps at portions 25, which portions 25, are heat sealed via heat provided by the sealing head 26. The sealing head 26 is located within the chamber 15. This particular arrangement in respect of sealingly tubular material 24 is particularly different from the prior art in that the overlap portions 25 are engaged by the belt 13 as well as the opposite side of the tubular material 24. Conventionally, the other two sides of the tubular material are generally engaged. This provides specific advantages in respect of the continuous sealing of the tubular material 24, which is driven in a continuous manner past the heating head 26.

Preferably the shafts 16 would be driven by servo motors so that the velocity of the arms 15, while the heads 14 are engaged with the curved portions 24 of the track 23, is greater than the velocity when the arms 15 are moving through an arc where the heads 14 are moving along the linear portion 25 of the track 23.

CLAIMS

1. A film drive unit 10 of a packaging machine using film sheet 11 to form tubular bag material into which a product is delivered, said machine further having sealing heads which intermittently engage the tubular bag material to form discrete bags; said film drive unit 10 comprising, a pair of endless belts 13 having generally parallel co-extensive portions engaging said bag material 10 to move same through said machine, first motor means drivingly attached to said endless belts 13 to drive same so that said belt portions have the same velocities and are moving in the same direction, and control means to control said first motor means to determine the speed of said endless belts 13 so that said sealing means is engaged with said bag material for a predetermined fixed period of time.

2. The film drive unit 10 of claim 1, wherein each of said belts passes around a pair of rollers 17, with one roller from each pair of rollers being driven by said first motor means.

3. The film drive unit 10 of claim 2, wherein said motor means is a single first motor coupled to the two driven rollers 17 by a worm gear drive unit 19.

4. The film drive unit 10 of claim 3, wherein each belt 3 is provided with a plurality of holes 14 spaced longitudinally of the belt 13, and said drive unit further includes chamber 15 means located adjacent each belt and to which a vacuum is delivered so that the tubular material 11 is held against said belts 13.

5. The film drive unit of claim 1 wherein said control means includes a film drive roller 21 about which said film sheet 11 passes prior to being delivered to said endless belts 13, further motor means 22 drivingly connected to said film drive roller 21 so as to determine the speed thereof, and said first motor means are constant torque motors which will drive said film sheet 11 at a speed dictated by said further motor means so that said bag material 11 is engaged with said sealing means 26 for a predetermined fixed period of time.

6. The film drive unit 10 of claim 4 or 5 further including a backing bar 20 mounted in a fixed parallel coextensive relationship with overlap portions 25 of said bag material 24 to be joined, and overlap portions25 are sandwiched between said backing bar 20 and a one of said belt portions, and further including a heating head 26 to heat seal said bag material portions while sandwiched between said backing bar 20 and belt portion.

7. A method of driving a film material 11 through a packaging machine, said machine having means to supply sheet film material, means 12 to form the film material into a tubular bag material, and sealing means to intermittently engage said bag material to sealingly close predetermined length of said bag material to form discrete bags containing product delivered to the interior of said bag material 11; said method being operable on a continuous basis and comprising the steps of driving said bag material 11 at a predetermined velocity while said sealing means engages said bag material, and then accelerating or deaccelerating said bag material to determine the production rate of said machine.

8. The method of claim 7 further including driving said belt by a first roller 21, which roller 21 is driven by motor means to determine the speed of said film material, and further driving said bag material by constant torque motors the speed of which is governed by the speed of said roller 21.

9. The method of claim 7 wherein overlap portions 25 of said bag material 24 are joined while sandwiched between a backing bar 20 and drive belt 13.

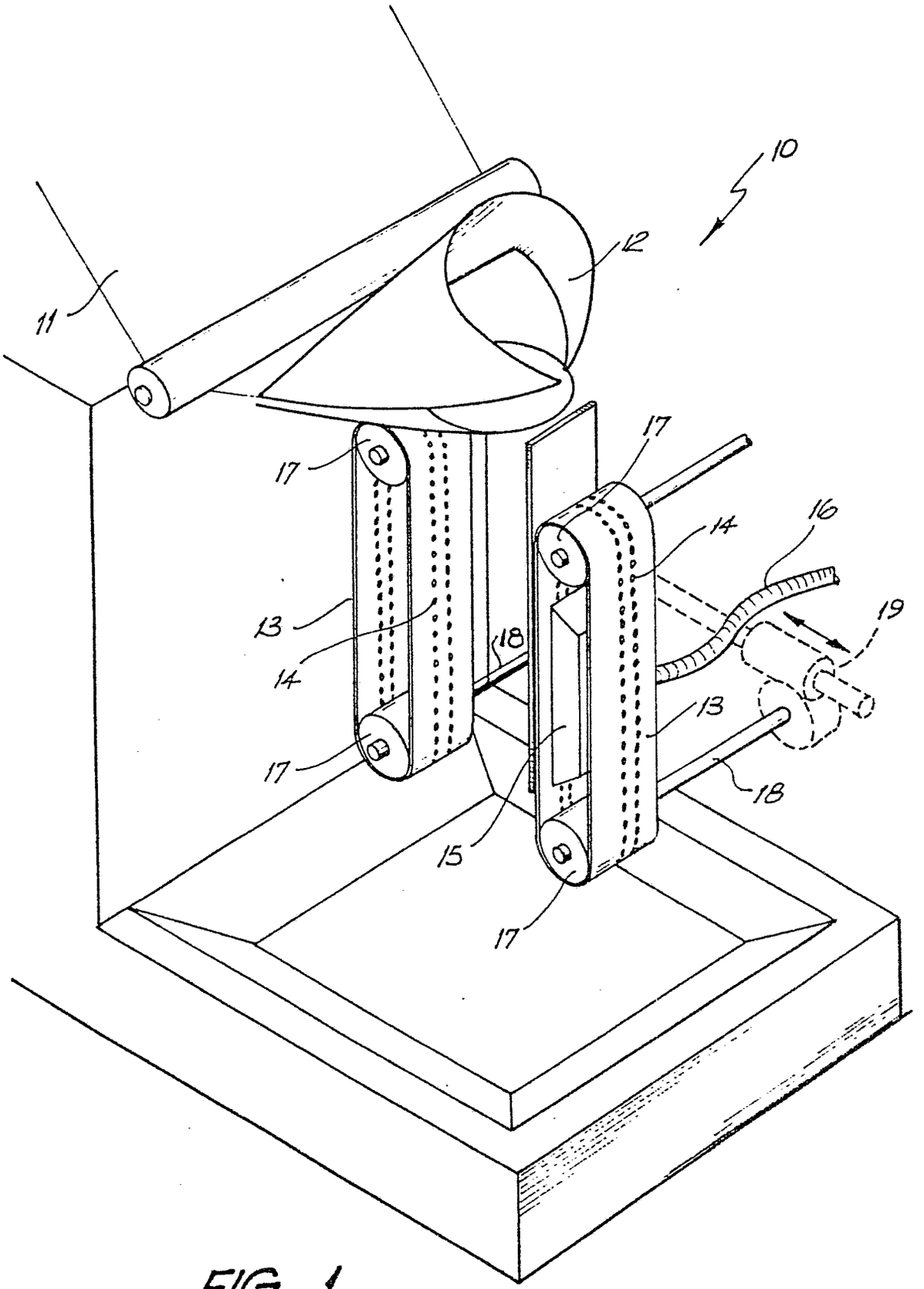

FIG. 1

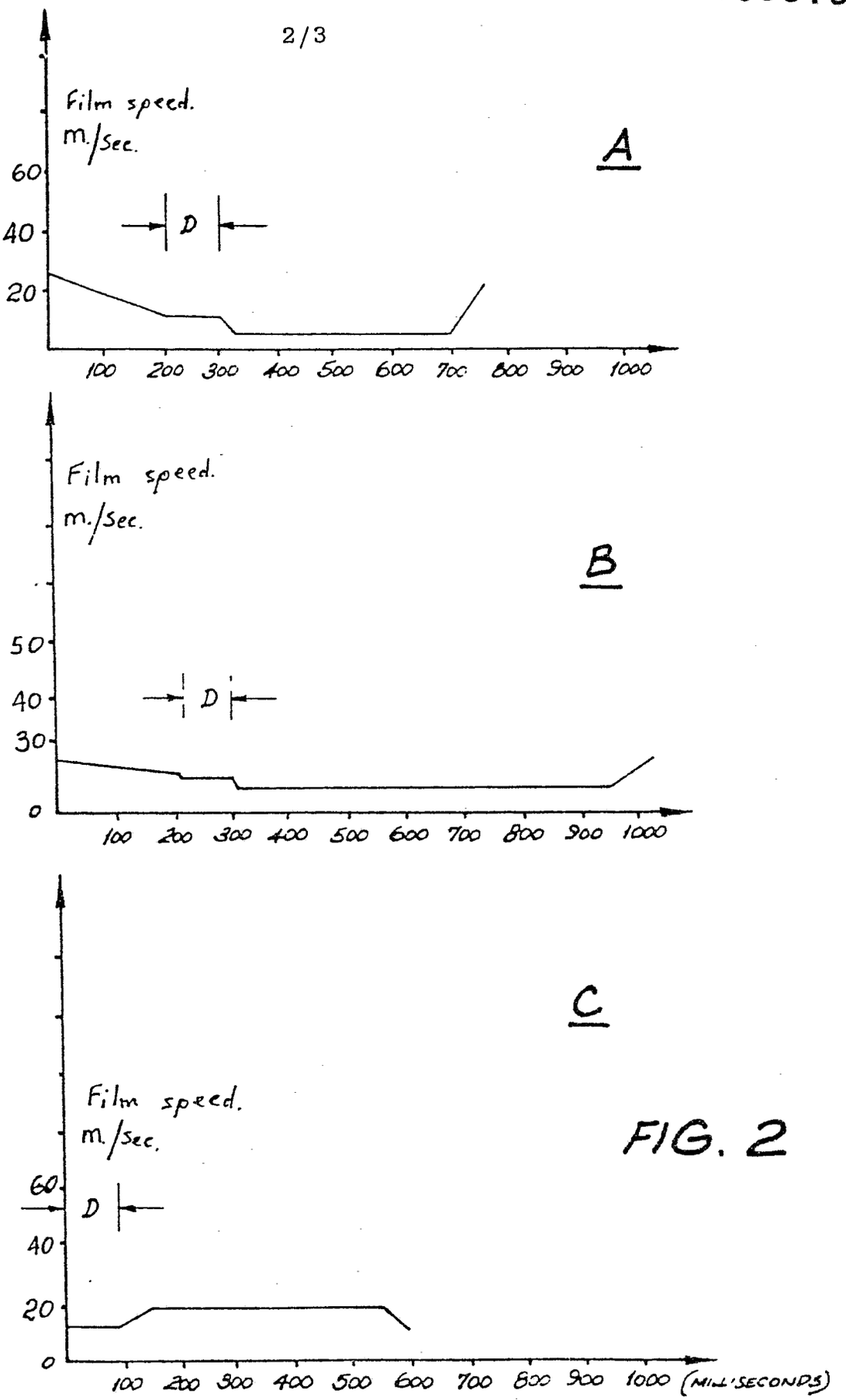
Film speed.
m./sec.
A
60
40
20
D
100 200 300 400 500 600 700 800 900 1000
Film speed.
m./sec.
B
50
40
30
0
D
100 200 300 400 500 600 700 800 900 1000
C
Film speed.
m./sec.
60
40
20
0
D
100 200 300 400 500 600 700 800 900 1000 (MILLISECONDS)

FIG. 2

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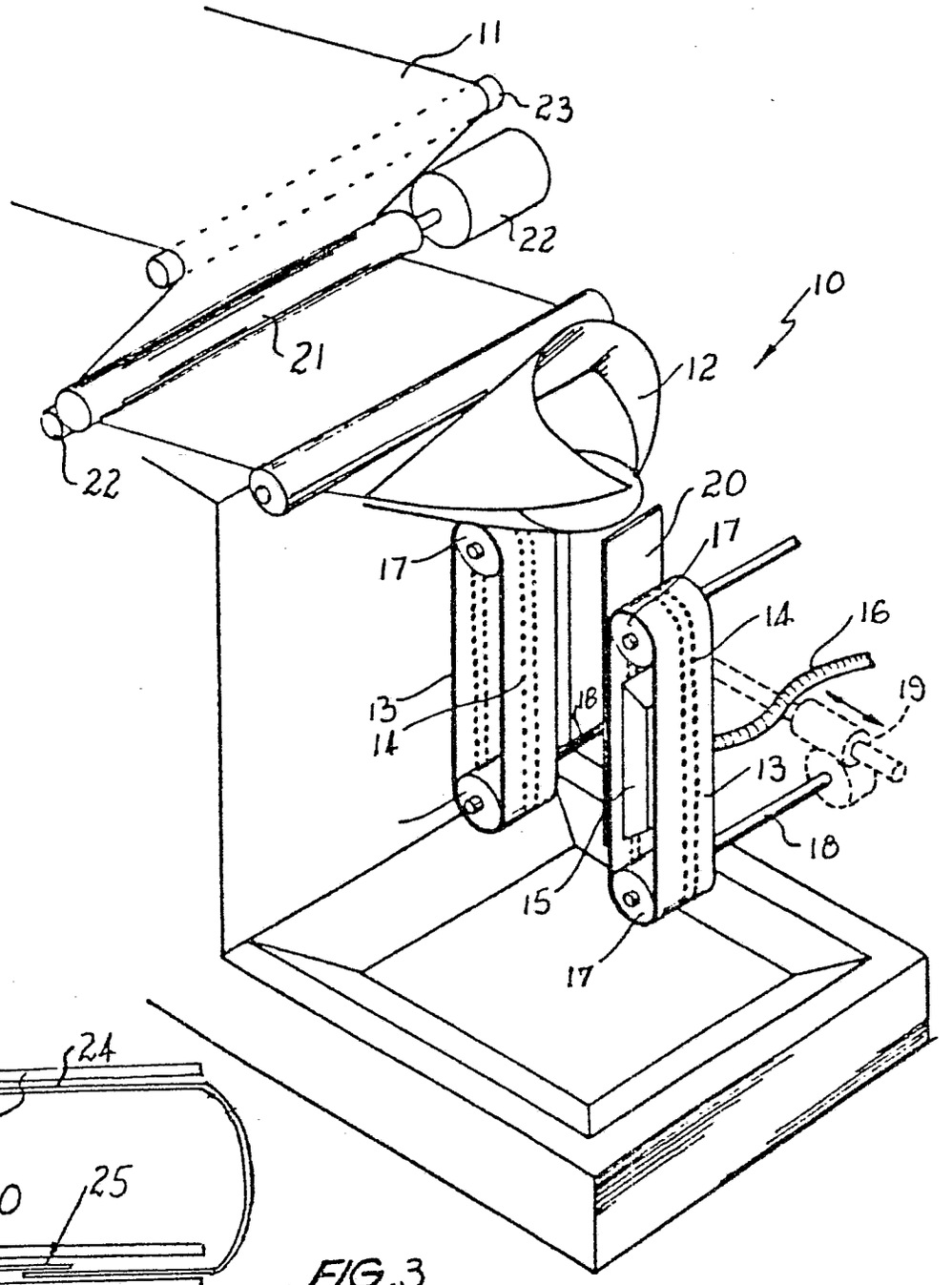

FIG.3

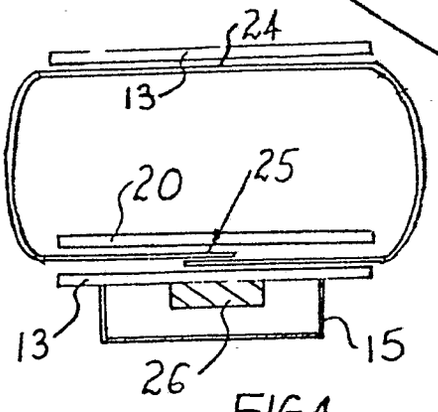

FIG.4