

12 **EUROPEAN PATENT APPLICATION**

21 Application number: 81302913.9

51 Int. Cl.³: **B 65 H 3/52**
B 65 H 3/04

22 Date of filing: 26.06.81

30 Priority: 27.06.80 US 163834

43 Date of publication of application:
06.01.82 Bulletin 82/1

84 Designated Contracting States:
DE GB IT

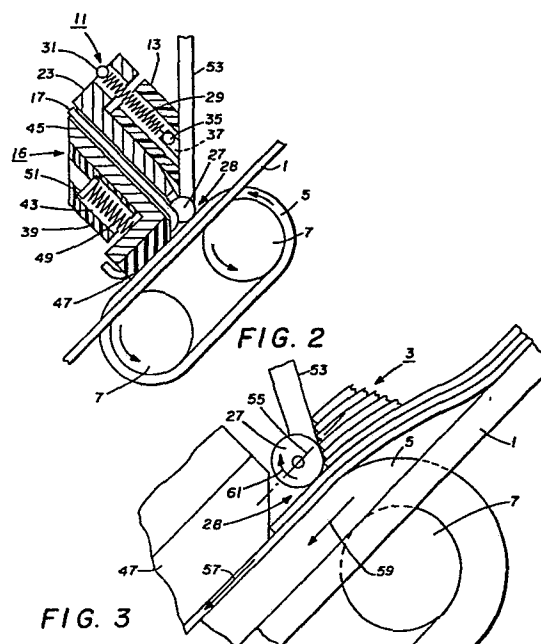
71 Applicant: **XEROX CORPORATION**
Xerox Square - 020
Rochester New York 14644(US)

72 Inventor: **Danchak, Nicholas, Jr.**
1332 Laramie Place
Lewisville Texas 75067(US)

74 Representative: **Prior, Nicholas J. European Patent**
Attorney et al,
Rank Xerox Limited Patent Department Rank Xerox
House 338 Euston Road
London NW1 3BH(GB)

54 **Apparatus for bottom feeding articles from a stack.**

57 A normal force applicator (11) for apparatus for bottom feeding articles from a stack. The normal force application (11) forms a rolling nip (28) between a roller (27) and a feed belt (5) designed to apply force to only a few of the bottom articles in the stack to be fed at a time. The rolling nip (28) ensures a constant normal force between the articles and the feed belt (5) that feeds articles to a separator (16) even using a very low applied force, independent of stack size. Also, since the roller (27) contacts only a few of the bottom articles, additional articles can be added to the stack readily even while the feeder is operating.



APPARATUS FOR BOTTOM FEEDING ARTICLES FROM A STACK

The invention relates to apparatus for bottom feeding articles, such as sheets of paper, envelopes or magazines, from a stack of such unseparated articles. Specifically, the invention is concerned with a normal force applicator for such apparatus which ensures a reliable feed to an article separator of the apparatus. The article separator may be, for example, a conventional friction retard device using a friction retard pad. The individual article thus separated feeds articles to the next processing station.

There are numerous applications in which a bottom feeder to feed articles serially from an unseparated stack of articles can be used, for example, to feed sheets of paper serially to a printer or copier or to feed envelopes to a printer or labeler. Obviously, many more examples could be given. One aspect common to all bottom feeders is the difficulty experienced in reliably driving and feeding but one article from the set of stacked articles. The reliability of bottom feeders can be affected by variations in the height of the stack of articles. For example, where only a few lightweight articles, such as sheets of thin paper, are in the stack, there may not be enough weight, that is, normal force, on the stack to make the feeder work properly. To alleviate such problems, a normal force applicator can be used.

Conventional normal force applicators are designed to press down on the top of the stack of articles to hold the stack down and to provide sufficient engagement force between the bottommost article of the stack of articles and the bottom feeder. The normal force applicators can be a weighted or spring-loaded plate, bail bar or the like. One problem with such normal force applicators is that they must be removed or lifted out of the way before more articles can be added to the top of the stack. Also, where the stack is relatively large, a larger force may be required where the force is applied through the entire stack to ensure proper feeder operation. The invention as claimed is intended to provide a remedy. It solves the problem of how to provide a reliable serial bottom feeder for articles, which feeder also allows for the convenient addition of further articles to the top of the stack.

One way of carrying out the invention is described in detail below with reference to drawings, which illustrate only one specific embodiment, in which:

-2-

Figure 1 is an end view looking into the normal force applicator from the direction of article input.

Figure 2 is a side-sectional view of the normal force applicator of this invention taken along lines 2-2 of Figure 1 and in addition shows a typical friction retard separator.

Figure 3 is a partial side-sectional view of the normal force applicator of this invention, which shows how the normal force applicator interacts with the stack of articles to be fed, the feed belt and the friction retard assembly.

Figure 4 is a top view of the frame for the normal force applicator of this invention.

Figure 5 is a top view of the friction retard pad support frame for use with the present invention.

Referring now to the Figures, an input tray 1 is provided on which a stack of articles 3 (see Figure 3) is provided. The stack of articles 3 may be, for example, a stack of paper or envelopes or any suitable article that it is desired to feed serially to a work station. Protruding through a slot 9 in the input tray 1 in feeding relationship to the stack of articles 3 is driven feed belt 5. Driven feed belt 5 is driven in the direction shown by the arrows (see Figures 2 and 3) by driven feed belt pulleys 7. The means for driving driven feed belt pulleys 7 is not shown although obviously one of the driven feed belt pulleys 7 could be, for example, mounted on the shaft of a motor; or, as another example, the driven feed belt 5 could be driven by frictional contact with a third pulley, and pulleys 7 would not be driven.

The normal force applicator generally designated as 11 includes a roller support frame 13, which is connected by bolts 15 to base 17. Roller support frame 13 has formed therein slot 19 (see Figure 4) and aperture 21, both of which traverse the complete height of roller support frame 13 as shown in Figure 2. Slot 19 acts as a guide for normal force applicator roller support 23, which is mounted for slidable movement in the space defined by slot 19 and base 17 when it is attached to base 17. Normal force applicator roller support 23 has formed thereon roller support arms 25 (see Figure 1) between which normal force applicator roller 27 is mounted for rotation. Normal force applicator roller support 23 is urged downwardly against driven feed belt 5 by normal force applicator spring 29 to form a rolling nip 28 therewith. Normal force applicator spring 29 in this instance is attached to pin 31 in slot 33 on normal force

-3-

applicator roller support 23 and to pin 35 in slot 37 on roller support frame 13. Also attached to base 17 is separator generally designated as 16, which in this instance comprises friction retard pad support frame 39 (see Figure 5). Friction retard pad support frame 39 has a depression or slot 41 and an aperture 43 formed therein. Friction retard pad support frame 39 is bolted by bolt means (not shown) to base 17. Friction retard pad support 45 is mounted for sliding motion in the space formed by slot 41 when it is attached to base 17. Attached to the bottom of friction retard pad support 45 is friction retard pad 47. Friction retard pad 47 is urged downward into contact with driven feed belt 5 by friction retard pad spring 49, which is held in aperture 43 of friction retard pad support 39 by shoulder 51.

In operation a stack of articles 3 is placed in input tray 1. Article guide means 53 (see Figure 3) is positioned such that none of the articles can rest above a centerline 55 of the normal force applicator roller drawn parallel to the direction of feed of the articles. This encourages the articles to be drawn into the rolling nip 28 formed between normal force applicator roller 27 and driven feed belt 5. When it is desired to feed an article, the driven feed belt 5 is driven by means (not shown) in the direction of travel of the fed articles as shown by arrow 59 (see Figure 3). The movement of driven feed belt 5 in the direction shown by the arrow 57 (see Figure 3) causes normal force applicator roller 27 to turn in the direction shown by arrow 61 (see Figure 3). Normal force applicator spring 29 urges normal force applicator roller 27 downward against the top of the articles present (usually two or three) in the rolling nip 28 formed by normal force applicator roller 27 and driven feed belt 5. The normal force applicator spring 29 is adjusted so that it will allow a few articles to be brought into nip 28 under the influence of a moving feed belt 5. The coefficient of friction between driven belt 5 and the bottom article of the stack of articles 3 and the rolling motion of normal force applicator roller 27 causes two or more articles from the stack of articles 3 to be drawn into the rolling nip 28 formed between normal force applicator roller 27 and driven feed belt 5. Since normal force applicator roller 27 is pressed against only a few of the bottom articles in the stack of articles 3, very little force is required to ensure feed of an article, even an article whose leading edge may not lie flat. Similarly, since normal force applicator roller 27 applies a force to only a few of the bottom articles in a stack of articles 3, the top of the stack of articles 3 is unencumbered allowing the addition of more articles to the stack of articles 3 even while the feeder is

operating. The articles in the stack of articles 3, which are moved into the rolling nip 28 formed between normal force applicator roller 27 and driven feed belt 5 by the movement of driven feed belt 5, are then brought into contact with friction retard pad 47. The coefficient of friction between driven feed belt 5 and the bottom article of the stack of articles 3 is chosen to be higher than the coefficient of friction between friction retard pad 47 and the same article so that the article can be moved between the friction retard pad 47 and driven feed belt 5 when driven feed belt 5 is operating. The friction retard pad 47 applies sufficient force to block the feed of the article next above the bottom article causing the friction retard pad 47 to act as an article separator.

Other types of separators may also be used with the present normal force applicator concept. It has been found that the present normal force applicator will operate reliably feeding ordinary sheets of paper or envelopes with no adjustments being required. Also, typically only 100 to 150 grams of force are required for a normal force applicator roller measuring about 1/4 inch in diameter and about 3/8 inch in length.

- 1 -

CLAIMS:

1. Apparatus for bottom feeding articles from a stack of articles comprising an input tray (1) for holding a stack of articles (3), said input tray (1) having a slot (9) formed therein, a driven feed belt (5) positioned to protrude through said slot (9) in said input tray (1) in feeding relationship to a stack of articles (3) on said input tray (1), and separator means (16) positioned in spaced relationship to said driven feed belt (5) and designed to allow the passage of only one article at a time therethrough, characterised by a normal force applicator roller (27) positioned between the stack (3) and separator means (16) in spaced relationship to said driven feed belt (5) to form a rolling nip (28) therewith, article guide means (53) for guiding the bottom articles in the stack of articles (3) to said nip (28) formed by said normal force applicator roller (27) and said driven feed belt (5), and means (29) for urging said normal force applicator roller (27) toward said driven feed belt (5) said means (29) being of strength sufficient to allow more than one article to pass into said rolling nip (28) under the influence of a moving driven feed belt (5).
2. Apparatus according to claim 1 wherein said guide means (53) is positioned to direct articles against the periphery of said normal force applicator roller (27) at a point below a centerline (55) of said roller (27) drawn parallel to the direction of feed of an article.
3. Apparatus according to claim 1 or 2 wherein said means for urging said normal force applicator roller (27) toward said driven feed belt (5) is a spring (29).
4. Apparatus according to claim 1, 2 or 3 wherein said separator (16) comprises a friction retard pad (47) placed in spaced relationship to said driven feed belt (5), and means (49) are provided to urge said friction retard pad (47) toward said driven feed belt (5) of strength sufficient to allow the passage of only one article at a time between said friction retard pad (47) and said driven feed belt (5).

1 / 1

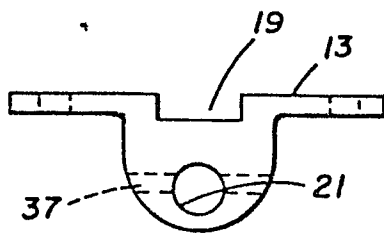


FIG. 4

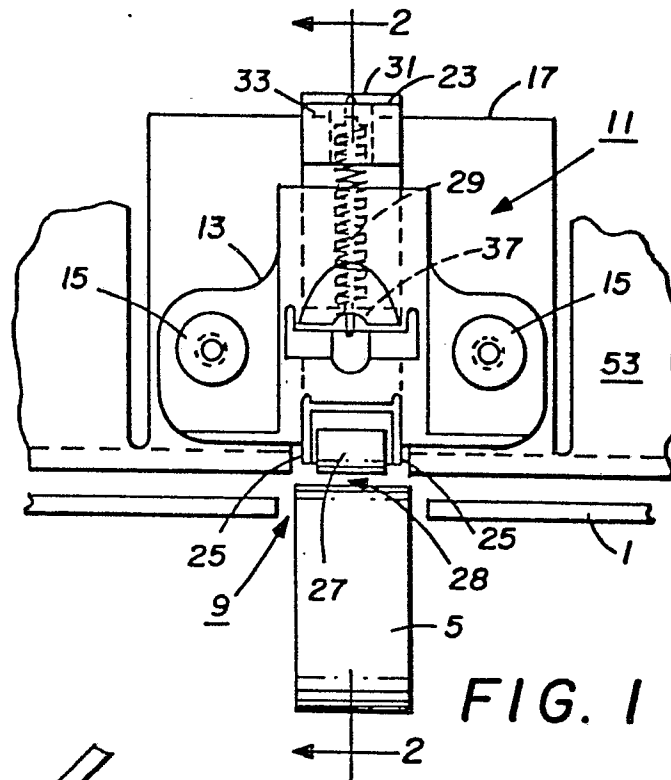


FIG. 1

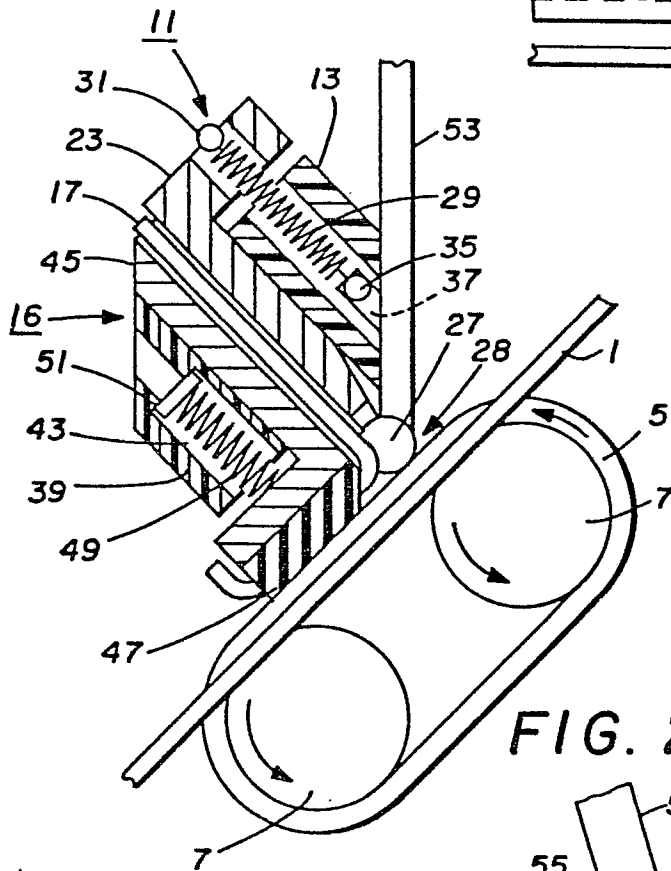


FIG. 2

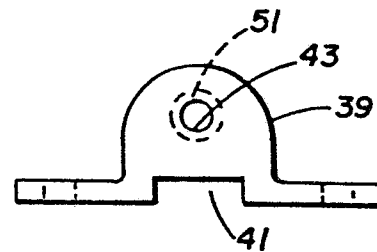


FIG. 5

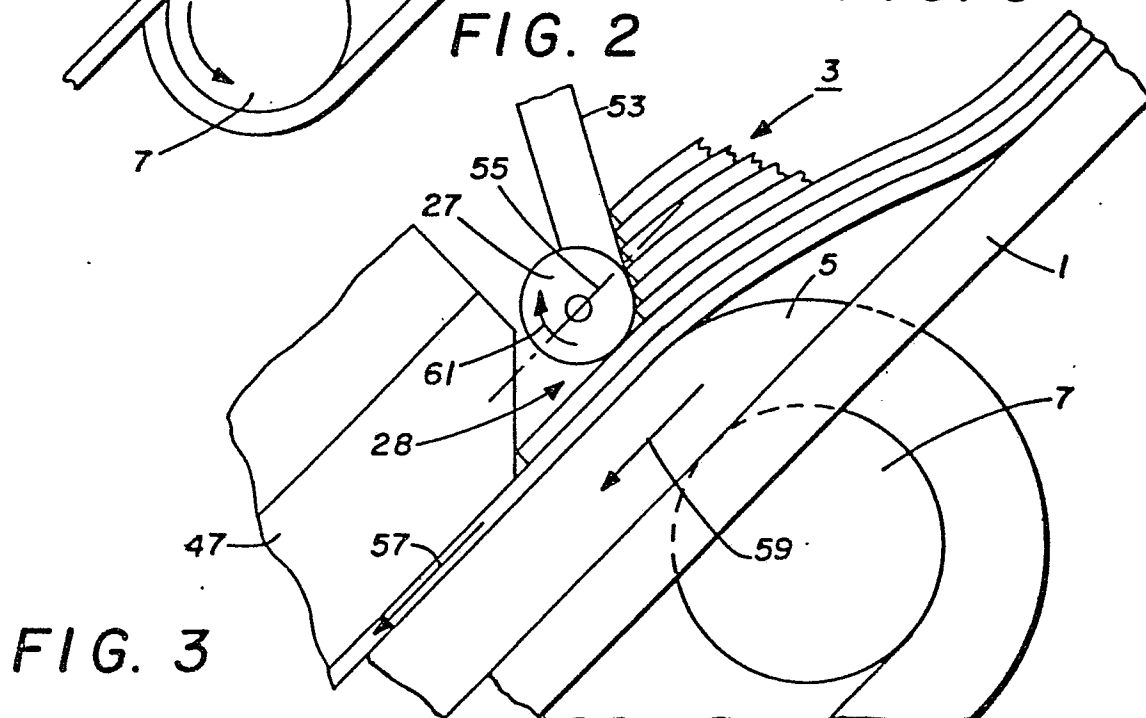


FIG. 3



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>US - A - 3 838 851</u> (ADDRESSOGRAPH) * Whole document *	1,3,4	B 65 H 3/52 3/04
	--		
	<u>FR - A - 2 393 750</u> (JONSAS) * Page 3, lines 27-33; figure 2 *	2	
	--		
A	<u>US - A - 3 970 298</u> (PITNEY-BOWES) * Whole document *	1	
	--		
A	<u>US - A - 3 984 659</u> (BALL COMPUTER PRODUCTS) * Whole document *	1	B 65 H
	--		
A	<u>US - A - 4 014 537</u> (ON APPLICANT'S NAME) * Whole document *	1	

			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			B 65 H
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
☒ The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	14-09-1981	LONCKE	