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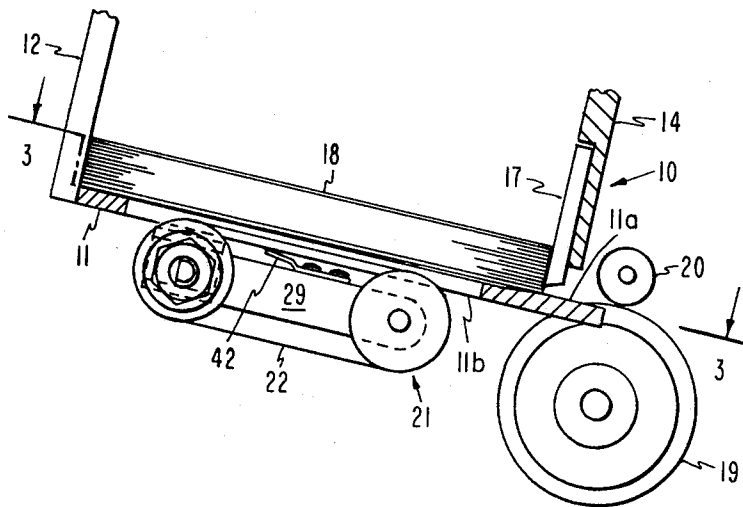
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[54] **CARD-FEEDING APPARATUS**
11 Claims, 4 Drawing Figs.

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[51] Int. Cl. **B65h 3/06**
[50] Field of Search. **271/41, 35,**
34, 36, 37, 38, 39, 40

[56] **References Cited**
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ABSTRACT: Apparatus for feeding cards sequentially from the bottom of a card stack including a pair of rolls, which may be termed a feed roll and a second roll, and having a friction belt passing over them with the feed roll being rotatably mounted on an arm which is pivoted on the center of rotation of the second roll so that the friction belt may be moved into forceful contact with the bottommost card of the stack on pivotal movement of the arm. A friction brake is provided for the feed roll, and the second roll is driven so that the friction belt in the vicinity of the feed roll is moved into contact with the bottommost card of the stack without any rotation of the feed roll about its own axis; and, subsequently, the force from the friction belt on the feed roll causes the feed roll to rotate about its axis with corresponding movement of the friction belt so that the belt displaces the bottommost card from the stack.



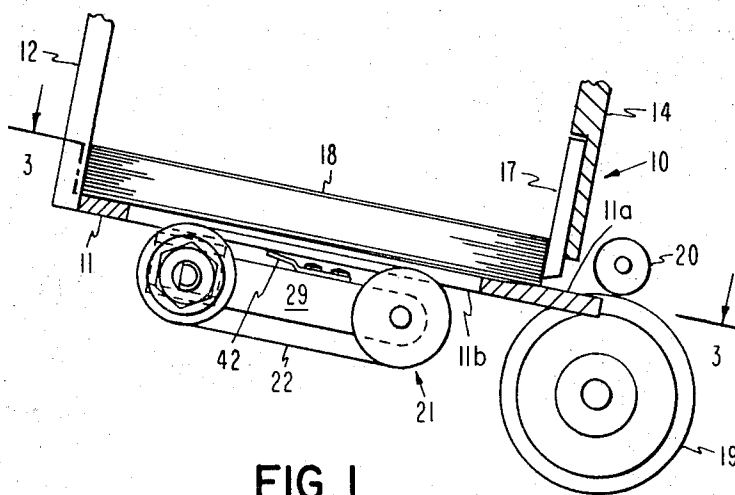


FIG. 1

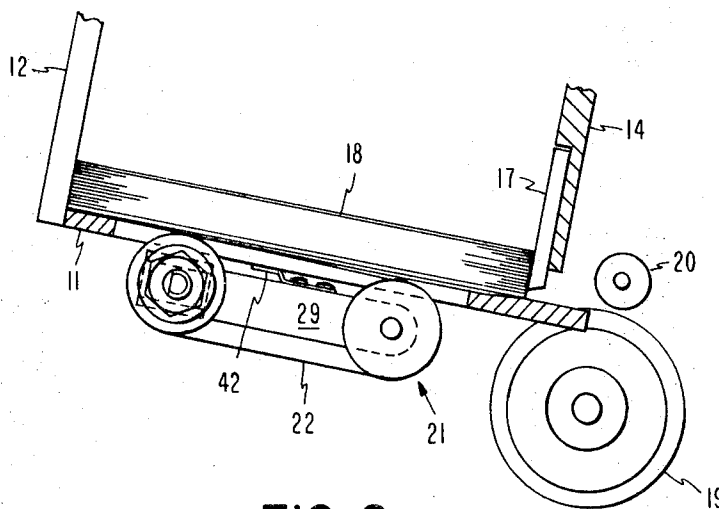


FIG. 2

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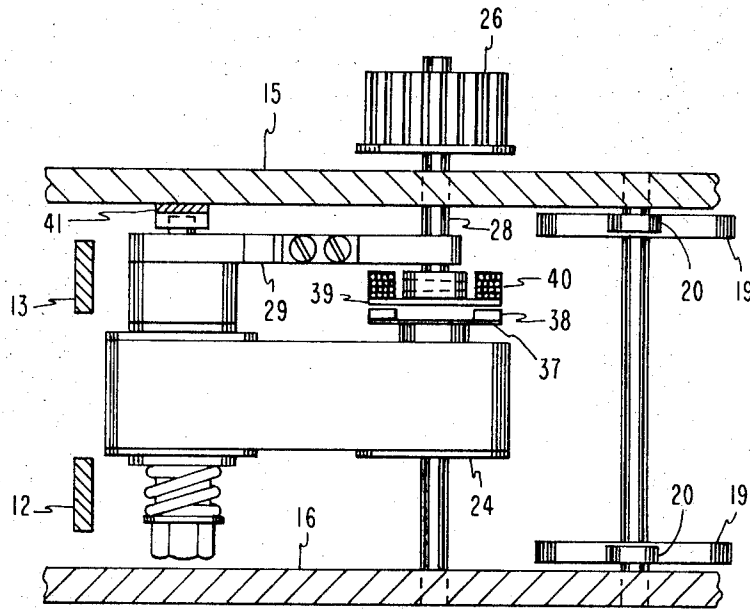


FIG. 3

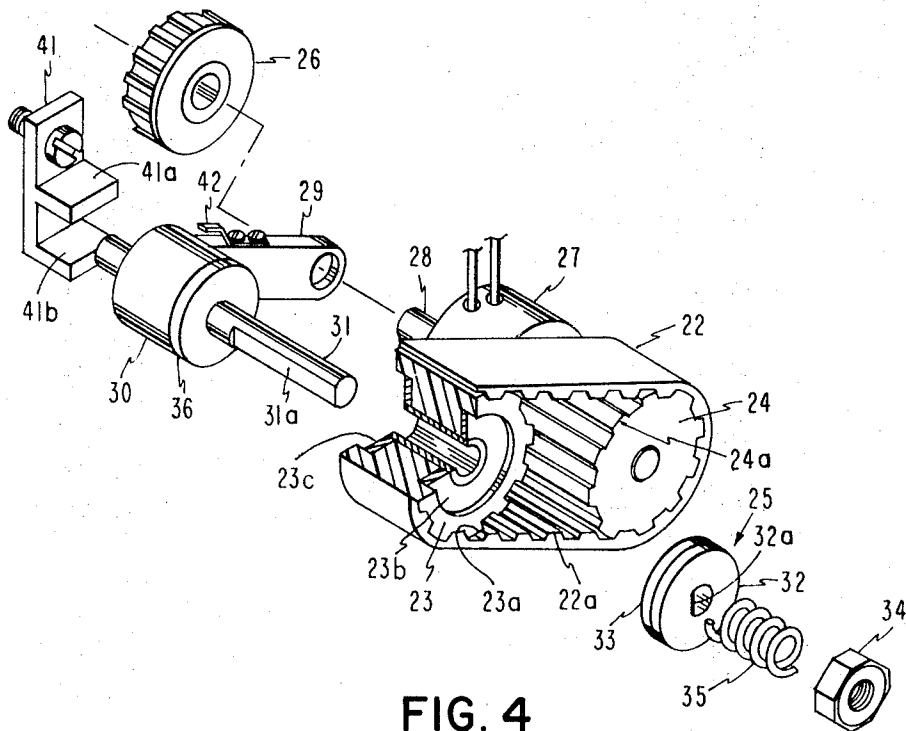


FIG. 4

CARD-FEEDING APPARATUS

The invention relates to card-feeding apparatus and more particularly to apparatus for sequentially displacing cards from one end of a stack of cards.

It has previously been common practice to sequentially feed cards from one end of a stack of cards by moving a constantly rotating pick roll into contact with the card on one end of the stack so that the pick roll engages the card and moves it from the stack.

It is an object of the present invention to provide an improved card-feeding apparatus in which a friction-engaging member is moved into contact with the card to be fed from a stack of cards when the friction-engaging member is stationary so as to utilize the static friction-engaging force for moving the card, this engaging force being relatively large compared to the dynamic friction-engaging force provided when a moving member is moved into contact with a stationary member.

It is a more particular object of the invention to provide such card-feeding apparatus utilizing a friction belt carried by a pair of spaced rolls which is pivoted by virtue of a pivotal mounting of one of the rolls so that the belt engages the bottommost card in a stack for feeding the card.

In a preferred form, the card-feeding apparatus of the invention includes a pair of rolls, which may be termed a feed roll and a second roll, and a friction belt disposed in looped form about the rolls and disposed in a slot in the bottom of a card hopper. The feed roll is pivotally mounted with respect to the axis of rotation of the second roll which is selectively driven, and a friction brake is provided for the feed roll so that the feed roll and the portion of the belt extending over the feed roll are moved upwardly through the slot into engagement with the lowermost card in the stack in the hopper when rotative force is first applied onto the second roll, with subsequent card-feeding movement of the belt taking place about the two rolls upon slipping of the friction brake.

The invention consists of the novel methods, constructions, arrangements and devices to be hereinafter described and claimed for carrying out the above-stated objects and such other objects as will appear from the following description of a preferred form of the invention, illustrated with reference to the accompanying drawings, wherein:

FIG. 1 is a longitudinal sectional view of a hopper for a stack of document cards including apparatus according to the invention for sequentially feeding cards from the bottom of the stack,

FIG. 2 is a longitudinal sectional view similar to FIG. 1 and showing the card-feeding apparatus in a different position,

FIG. 3 is a plan view of the card-feeding apparatus taken substantially on line 3-3 of FIG. 1 in the direction indicated, and

FIG. 4 is a perspective exploded view of the parts of the card-feeding apparatus.

Like characters of reference designate like parts in the several views.

Referring now to the drawings, the illustrated card-handling apparatus may be seen to comprise a hopper 10 which is formed by a baseplate 11, a pair of standards 12 and 13 at the rear of the hopper, an upstanding plate 14 at the front of the hopper, and plates 15 and 16 at the sides of the hopper. A throat knife 17 is fixed to the plate 14 and has a sharpened lower edge that extends in close proximity to a top surface 11a of the plate 11. A stack of cards 18, which may be of the type used in data processing machines and which may be punched or printed, is disposed in the hopper 10 and is supported by the baseplate 11. The spacing between the lower edge of the knife 17 and the surface 11a of the plate 11 is just slightly greater than the thickness of one of the cards 18 so that the knife 17 is effective to allow only one card at a time to pass through the gap between the knife 17 and the plate surface 11a. Two pairs of lower pull rolls 19 and upper pull rolls 20, with a nip existing between each roll 19 and the roll 20 of the pair, are disposed adjacent the surface 11a of the plate 11; and one of these rolls in each pair is driven so that, when one of the cards 18 passes from beneath the stack of cards 18 through

the gap between the knife 17 and the plate surface 11a, the rolls 19 and 20 receive the card between them and pull the card completely free from the hopper 10.

Card-feeding apparatus 21 is disposed beneath the hopper 10 and comprises, generally, a friction belt 22 held in the form of a loop by means of a pair of rolls 23 and 24 (which may be termed a feed roll 23 and a second roll 24), a brake mechanism 25 for braking rotation of the roll 23, a drive roll 26, and a friction clutch 27 for drivingly connecting the rolls 26 and 24.

The drive roll 26 is rotatably driven from any suitable power source (not shown) and is fixed on one end of a shaft 28 that is journaled in plates 15 and 16. The shaft 28 extends through the clutch 27, and the roll 24 is rotatably disposed on the shaft 28. An arm 29 is swingably mounted on the shaft 28 and is formed with a hub 30 on its end in which a shaft 31 is fixed. The roll 23 is rotatably disposed on the shaft 31.

It will be noted that the rolls 23 and 24 are provided with external teeth 23a and 24a, respectively; and the friction belt 22 is provided with internal teeth 22a that mesh with the teeth 23a and 24a. The baseplate 11 of the hopper 10 has a slot 11b therein, and the rolls 23 and 24 and the belt 22 extend into the slot 11b as is shown in FIGS. 1 and 2.

The brake mechanism 25 comprises a washer 32 disposed on the shaft 31 and having a friction facing 33 fitting in a cylindrical depression 23b formed in a face of the roll 23. It will be noted that the shaft 31 has a flat 31a formed on one side thereof and that the washer 32 has a corresponding flat 32a so that the washer 32 is slidable but nonrotatable on the shaft 31. A nut 34 is disposed on the end of the shaft 31, and a spring 35 is disposed between the nut 34 and the washer 32. The hub 30 has a friction washer 36 fixed on it which fits in a depression 23c formed in a face of the roll 23; and, as the nut 34 is tightened on the shaft 31, the nut thus has the effect of clamping the roll 23 between the washer 32 and the hub 30 and more particularly between the friction members 33 and 36 for providing a braking action on the roll 23.

The friction clutch 27 may be any suitable friction clutch and, as shown (see FIG. 3), comprises an axially flexible circular plate 37 fixed with respect to the roll 24 and having a friction facing 38, a pressure plate 39 fixed on the shaft 28, and an electric winding 40 carried by the plate 39 for magnetically drawing the plates 37 and 39 together in frictional engagement with flexing of the plate 37 out of planar shape when the winding 40 is energized.

A motion-limiting bracket 41, which is fixed on the plate 15, has flange portions 41a and 41b that receive the end of the shaft 31 between them; and the distance between the flange portions 41a and 41b is greater than the diameter of the shaft 31 so that the shaft 31 may move upwardly and downwardly, such as from a position as illustrated in FIG. 1 in which the belt 22 does not protrude above the upper surface of the plate 11 and is out of contact with the bottommost card 18 of the stack of cards in the hopper 10 to an upper position as illustrated in FIG. 2 in which the belt 22 does protrude above the upper surface of the plate 11 and is in engagement with the bottommost card 18 of the stack. A leaf spring 42 is fixed on the upper edge of the arm 29 and is adapted to contact the bottom surface of the plate 11.

In operation, a stack of cards 18 is positioned in the hopper 10; and the cards are held in vertically stacked condition by the plate 14 and the standards 12 and 13. When the clutch 27 is deenergized, the arm 29 is in its position as illustrated in FIG. 1; and the belt 22 is out of engagement with the bottommost card 18 of the stack of cards.

When it is desired to cause the selective feeding of a card 18 from the bottom of the stack of cards in the hopper 10, the clutch winding 40 is energized; and this has the effect of engaging the friction plates 37 and 39. The roll 26 and the shaft 28 are continuously driven, and the roll 24 is thus rotatably driven through the clutch 27 from the roll 26 and shaft 28. The brake mechanism 25 provides a friction-restraining force on the roll 23 for yieldably holding it from rotation, the roll 23

being engaged between the hub 30 and the washer 32 for this purpose, with the spring 35 held by the nut 34 applying a spring force against the washer 32. Thus, upon initial engagement of the clutch 27, a couple is exerted through the belt 22 on the roll 23, the shaft 31, and the arm 29 causing the arm 29 to move upwardly about the shaft 28 as a pivot into its position as illustrated in FIG. 2 in which the belt 22 protrudes above the upper surface of the plate 11 and in which the roll 23 exerts a lifting force on the lowermost card 18 in the stack of cards through the intermediary of the belt 22; and the belt 22 is in direct contact with the bottommost card 18. During this upward pivoting movement of the arm 29, the shaft 31, and the roll 23; the roll 23 remains rotatably stationary about its shaft 31. Therefore, the belt 22, when it first makes contact with the lowermost card 18 in the stack, is stationary. The shaft 31 thus moves from a position in contact with the flange portion 41b to a position in contact with the flange portion 41a; and, upon being thus restrained, and while the friction belt 22 is in engagement with the lowermost card 18 in the vicinity of the roll 23, the roll 23 begins rotation under the driving force from the roll 24 exerted through the friction belt 22 which moves with rotation of both rolls 23 and 24. This motion of the friction belt 22 propels the lowermost card 18 in the stack forwardly through the gap between the throat knife 17 and the surface 11a of the plate 11 so that the lowermost card 18 is thus fed from beneath the card stack. The card, after passing through this gap, moves into the nips between the rolls 19 and 20; and the rolls 19 and 20 pull the card completely from beneath the card stack to any subsequent card-processing apparatus (not shown).

The leaf spring 42, during this upward movement of the arm 29, strikes the bottom surface of the hopper 10 and thus has its free end depressed against its own resilient action. When the clutch 27 is subsequently deenergized, the plate 37 returns to planar unflexed condition disengaging the clutch 27; and the spring 42 is then effective to move the arm 29 back into its FIG. 1 position and to move the belt 22 out of engagement with the card stack so as to render the card-feeding mechanism 21 inoperative.

Since the belt 22 first comes into contact with the bottommost card 18 upon an energization of the clutch 27 when the roll 23 is stationary about the shaft 31 and when the belt 22, likewise, has no movement about the shaft 31, the belt 22 engages the bottommost card 18 under static friction conditions which provide a greater engaging or gripping force of the belt 22 with respect to the bottommost card 18 than would be obtained if the belt 22 were moved into engagement with the bottommost card 18 when moving. Subsequently, utilizing this relatively high engaging force of the belt 22 with respect to the bottommost card 18, the belt 22 is effective to firmly grip the bottommost card 18 and complete movement of it through the gap between the throat knife 17 and the plate surface 11a.

The card-feeding apparatus 21 advantageously is independent of any controls except only for the clutch 27; and, when the clutch 27 is disengaged and is ineffective for driving the belt 22, the belt returns to its lower FIG. 1 position to reduce the possibility of card damage by the throat knife 17. Any desired variable feed rate of the cards 18 out of the hopper 10 may be obtained by selectively controlling the engagement and disengagement of the clutch 27, it being apparent that a card 18 is fed every time the clutch is engaged. The belt 22 provides a relatively large friction area that contacts the bottommost card 18 in the stack and is brought into initial contact with the card when stationary to utilize its static friction force for engaging and moving the card. In addition, the card-feeding apparatus while being suitable for the intended purpose is quite simple in construction and is thus economical of manufacture.

It is to be understood that the invention is not to be limited to the specific methods, constructions and arrangements shown and described, except only insofar as the claims may be so limited, as it will be apparent to those skilled in the art that changes may be made without departing from the principles of the invention.

I claim:

1. Apparatus for feeding cards sequentially from one end of a stack of cards comprising:

a feed roll;
means for mounting said roll so that it may be moved toward the card stack to exert a force on the stack; and
drive means for moving said roll toward said stack as aforesaid and for initiating rotation of said roll about its own axis after the roll has completed its movement toward said stack for thereby displacing a card at the end of a stack from the stack.

2. Apparatus for feeding cards as set forth in claim 1, said mounting means including a pivotally mounted arm carrying said roll for pivotal movement and said drive means including a second roll and a friction belt extending around said rolls and moved by said feed roll into frictional contact with a card on the end of the stack as said feed roll moves toward the stack as aforesaid.

3. Apparatus for feeding cards as set forth in claim 2, said arm being mounted on the axis of rotation of said second roll and the apparatus further comprising a friction brake effective on said feed roll so as to hold said feed roll stationary from rotation about its own axis until said feed roll has completed its movement toward said stack.

4. Apparatus for feeding cards sequentially from one end of a stack of cards comprising:

a roll;
a pivotally mounted arm carrying said roll so that the roll may be moved toward the card stack to exert a force on the stack; and
means for applying a tangential force on said roll tending to rotate the roll so that said arm is pivoted due to said tangential force and said roll is rotated about its own axis when exerting force on the card stack so as to displace the card at the end of the stack.

5. Apparatus for feeding cards as set forth in claim 4, and further comprising a friction brake effective on said roll so that said roll is moved to exert a force on the stack when stationary on its own axis and is subsequently rotated about its own axis when said friction brake yields so as to displace the card at the end of the stack.

6. Apparatus for feeding cards sequentially comprising:

a hopper for holding a stack of cards;
a feed roll;
a pivotally mounted arm carrying said roll so that the roll may be moved toward one end of the card stack;
a second roll;
a friction belt extending around said rolls and movable with said feed roll toward one end of the card stack so that the belt engages a card on the end of the stack; and
means for drivingly rotating said second roll so that said feed roll is moved toward said stack to cause said friction belt to engage a card on the end of the stack and said feed roll is subsequently rotated about its own axis and said friction belt is correspondingly moved about said rolls when in contact with the card at the end of the stack so as to displace the card.

7. Apparatus for feeding cards as set forth in claim 6, and further comprising a friction brake for said feed roll to cause the pivoting movement of said arm to take place prior to rotation of said feed roll about its own axis and corresponding movement of the friction belt to displace a card at the end of the stack.

8. Apparatus for feeding cards as set forth in claim 7, said driving means for said second roll including a drive shaft, and said arm being pivotally mounted on said drive shaft.

9. Apparatus for feeding cards as set forth in claim 8, said friction brake comprising a washer and a spring for holding said washer in pressure contact with said feed roll.

10. Apparatus for feeding cards as set forth in claim 8, and further comprising means for limiting the pivotal movement of said arm and of said feed roll and spring means for moving said belt out of engagement with the card at the end of the stack when driving of said shaft ceases.

11. In a method of feeding cards sequentially off the end of a stack of cards, the steps which comprise, applying a tangential force to a friction faced roll which is rotatable about its own axis and which has its axis constrained to move in a circle, and yieldably braking said roll from rotation on its own axis so

that said tangential force initially moves said roll to exert a force on the end of the stack of cards and so that said roll subsequently overcomes the braking force to rotate about its own axis to thereby displace the card at the end of the stack.

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