

[54] CARD FEEDER

[72] Inventor: Cecil J. Davis, West Chester, Pa.

[73] Assignee: Bridge Data Products, Inc., Philadelphia, Pa.

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Primary Examiner—Joseph Wegbreit
Assistant Examiner—Bruce H. Stoner, Jr.
Attorney—Seidel, Gonda & Goldhammer

[57] ABSTRACT

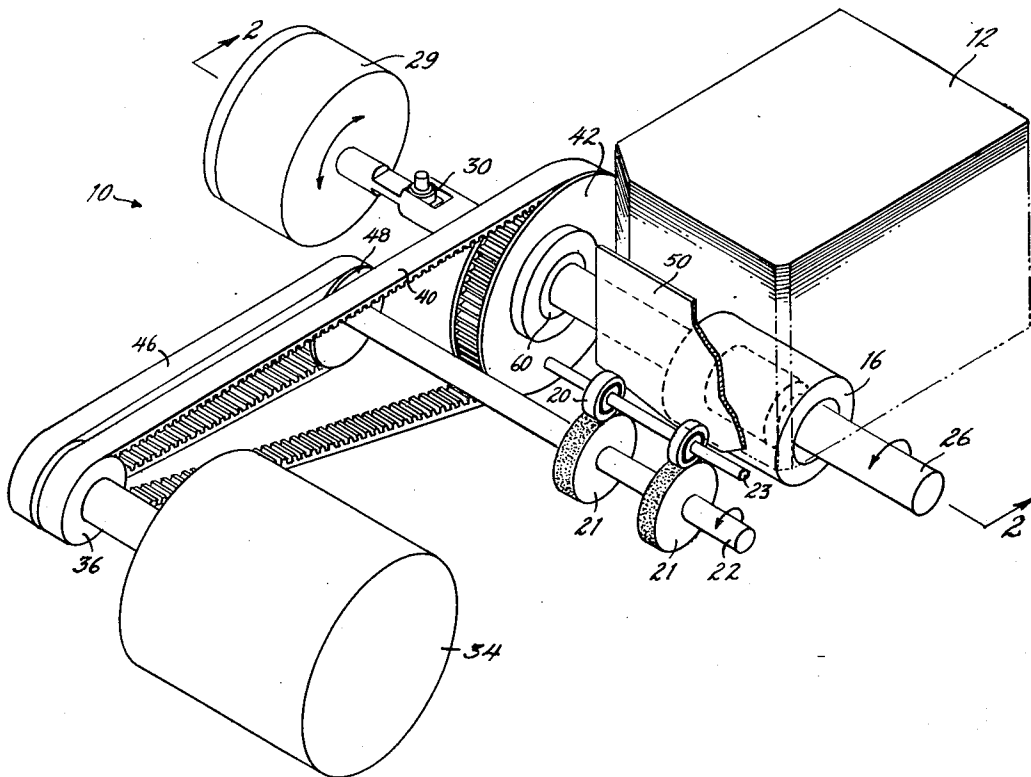
A card feeder that relies upon an actuator such as a rotary solenoid to impart intermittent driving force to a feed wheel which underlies a deck of cards. Forward motion of the feed wheel moves a card from the deck forwardly until it is engaged by transport wheels which move the card to the next working station. A velocity governor is provided for limiting the maximum velocity of the shaft and the feed wheel during response to energization of the rotary solenoid.

[56] References Cited

UNITED STATES PATENTS

2,996,862	8/1961	Johnson et al.	271/41 X
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5 Claims, 4 Drawing Figures



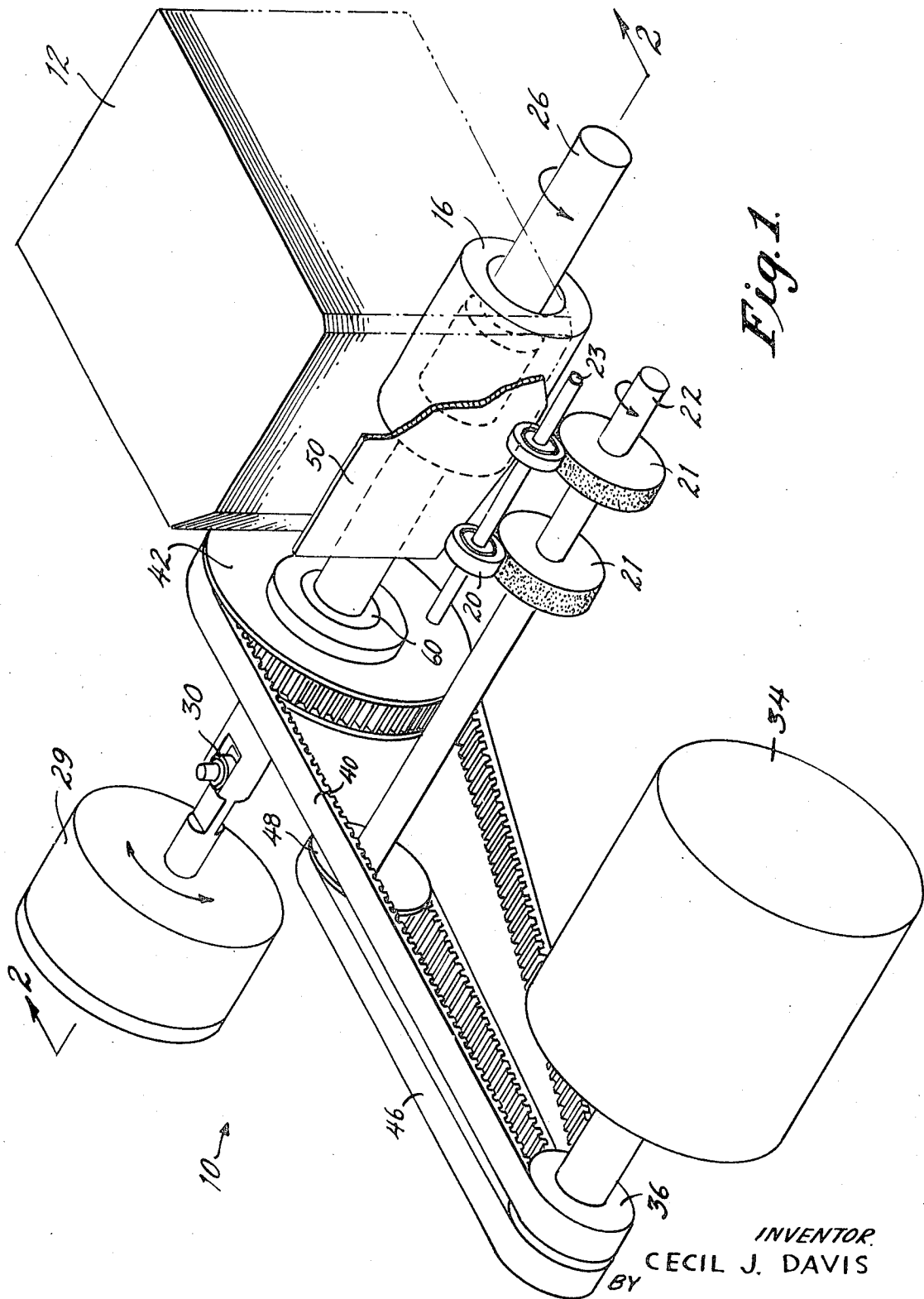
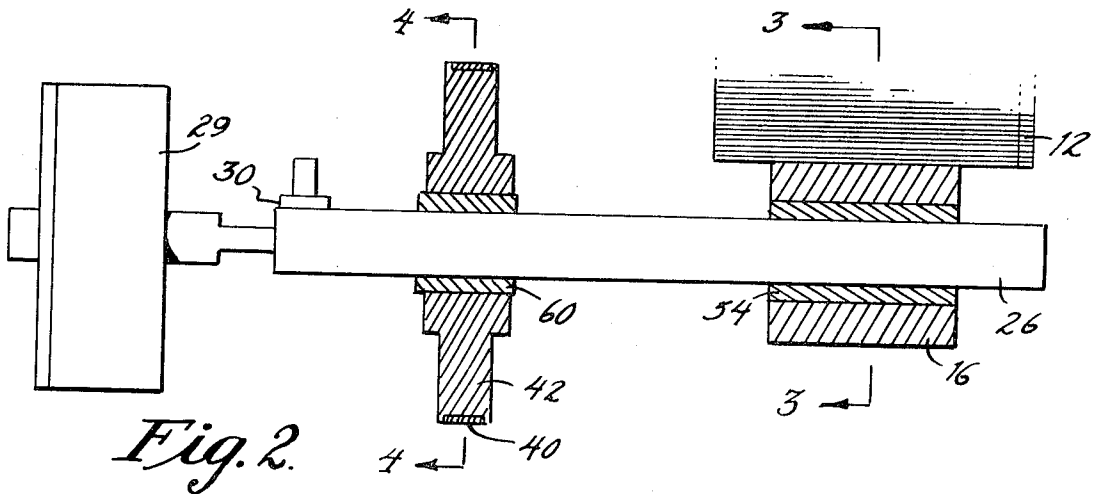
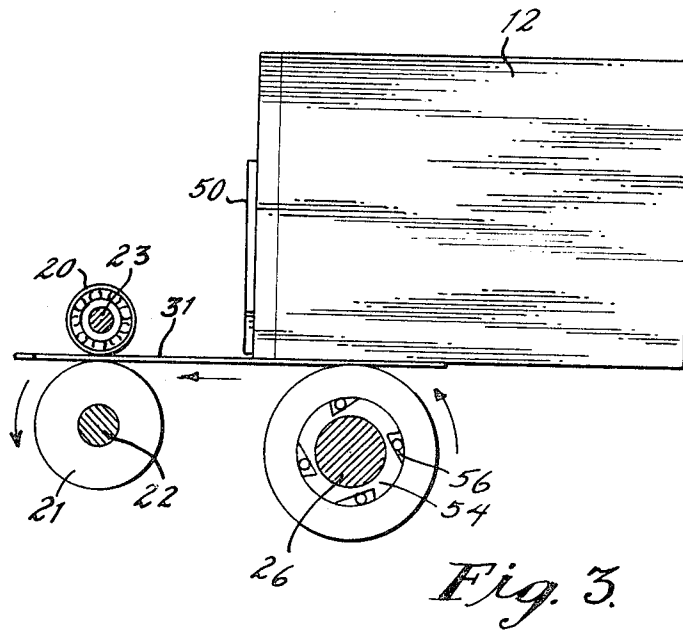
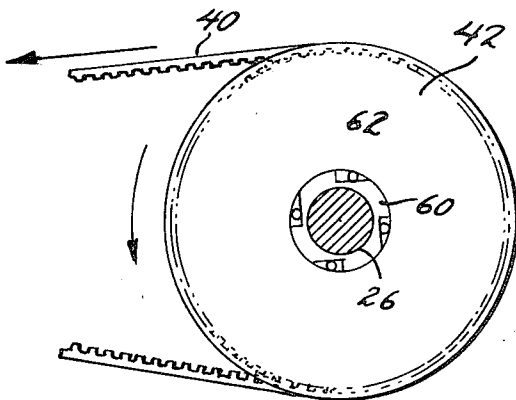


Fig. 1.

INVENTOR
CECIL J. DAVIS

BY
Seidel, Gonda & Goldhammer
ATTORNEYS.



INVENTOR
 CECIL J. DAVIS
 BY
 Seidel, Gonda & Goldhammer
 ATTORNEYS.

CARD FEEDER

This invention relates to a card feeder and more particularly to a card feeder of the type using an actuator such as a rotary solenoid with a velocity governor thereon to limit the speed at which cards are fed from a deck.

Feeders used in card and paper feeding machinery known heretofore vary from high-speed vacuum feeders to very low-speed manual-type feeders. It has been known to feed cards by means of a knife edge that engages the rear end of one of the cards in a deck of cards and pushes the card through a metering throat to a set of constantly driven rollers. Motion for the knife edge is generated by a slider-crank-type linkage to provide reciprocating motion. As is well known, cams or eccentric drives may be used to generate this reciprocating motion. Intermittent demand-type operation is achieved by virtue of a wrap-spring clutch and is controlled by a solenoid and a linkage.

A second type of feeder is known as a "Puck Feeder". This type of feeder employs a constantly driven high-friction roller. The roller is mounted for pivotal movement into and out of engagement with the lowermost card of a deck of cards and drives that card through a metering throat into a set of rollers. Intermittent feeding is permitted by virtue of pivoting the puck away from the stack by means of a solenoid and linkage arrangement.

Additionally, it has been known to feed cards by a vacuum feeder. Normally this arrangement is used for high-speed card or paper feeding. The vacuum is normally applied by switching a valve which couples the vacuum source to the lines which are attached to the feed drum. By virtue of the solenoid controlled throat, interruption and feeding is provided by switching the vacuum on and off in conjunction with switching the metering throat solenoid.

Each of the above-noted types of feeders have distinct disadvantages in terms of either reliability, wear, cost, or all of the aforementioned. The knife-type feeder employs many sliding linkages, and a wrap-spring clutch. Thus it is subject to wear, high cost and thus it is unreliable for feeding long sheets of cards or paper. Puck feeders, while reasonably low in cost, disturb the deck of cards as they engage the lowermost card and thus are unreliable as feeders. Vacuum feeding, while the most reliable of the above-noted feeders is expensive and requires critical adjustment.

Accordingly, it is an object of this invention to provide a card feeder which obviates the problems known in the prior art heretofore.

It is a further object of this invention to provide a card feeder that has a high degree of reliability and is relatively inexpensive.

It is still a further object of this invention to provide a card feeder which is adapted to engage the end card in a deck of cards and forward it to a transport roll.

Generally the invention relates to an apparatus for feeding cards from a deck comprising a feed wheel supported for frictional engagement with an end card of a deck of cards, means for causing said feed wheel to intermittently rotate thereby feeding said end card from said deck, and means for limiting the velocity of said feed wheel to a predetermined maximum.

Other objects and advantages of the subject invention will be apparent from the detailed description therein which follows wherein:

FIG. 1 is a perspective view of a card feeder constructed according to the invention.

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1.

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2.

FIG. 4 is a sectional view taken along line 4—4 of FIG. 2.

Now referring to the drawing for a detailed description of a presently preferred form of the invention, a card feeding device generally indicated at 10 is shown. The card feeder supports a deck of business cards or the like 12 so that they rest on a suitable feed wheel 16. The feed wheel is adapted to rotate in the direction indicated in FIG. 3 to advance the lowermost card forwardly so that it can be engaged in the nip defined by transport wheels 20 and 21. Transport wheels 21

are fixed to a driven shaft 22 while transport wheels 20 are mounted on shaft 23 and are frictionally driven by virtue of their engagement with wheels 21.

The feed wheel 16 is mounted on a feed shaft 26 for rotation therewith. The feed shaft is in turn mounted in suitable bearings (not shown) for reciprocating motion about its longitudinal axis. The reciprocating movement of the feed shaft is achieved by selective energization of a reciprocating solenoid 29. Reciprocating solenoids per se are relatively well known in this art and thus need not be described in detail. It may be said, however, that the solenoid is constructed so that it rotates through approximately 25°. It should be apparent to those skilled in the art from what follows herein that the angle of rotation of feed shaft 26 is not critical providing it rotates sufficiently so that feed wheel 16 enables the lowermost card to be driven into engagement with the transport wheels.

The rotary solenoid 29 may be releasably connected to feed shaft 26 by a suitable connection 30.

The feed wheel 16 is connected to the feed shaft 26 in such a way that the feed wheel is driven by the shaft when the solenoid causes the shaft to move in a first direction but is stationary relative to the card deck when the feed shaft and the solenoid move in the opposite direction. This arrangement permits the feed wheel to successfully move the lowermost card forwardly away from the deck without returning it to the deck during the second portion of the rotary solenoid and shaft movement. The means for achieving this function is shown schematically in FIG. 3 as a one-way bearing 54 of the type which may use rollers and slots 56 or any other suitable well-known arrangement. As shown in FIG. 3 when the solenoid is operable to feed the lowermost card 31 from the deck it rotates in a counterclockwise direction. This drives the rollers into the narrow portions of the slots where they bear against the inner surface of the feed wheel and thus cause it to rotate in the same direction as the shaft. Since the feed wheel is in contact with the lowermost card on the deck it pulls that card forwardly. When the solenoid causes shaft 26 to rotate in a clockwise direction the rollers roll to the deep portions of the slot and thus the movement of the shaft does not effect the feed wheel.

The lowermost card 31 is urged forwardly until it is engaged in the nip defined by transport wheels 20 and 21 whereafter it is pulled by those cards into the next operating station.

A problem which has stood in the way of developing a solenoid-type card feed has been the fact that as the core element moves into the solenoid coil it does not do so at a uniform velocity or acceleration but rather at an ever increasing rate of acceleration. Thus, as the shaft and feed wheel rotate in the direction which permits a card to be fed from the deck it is possible that the card will be accelerated up to a velocity which is greater than that at which the transport rolls are turning and thus the card rather than being fed through the transport rolls will be crushed thereby. Accordingly, the subject card feeder also includes a velocity governor which limits the maximum speed of the feed shaft to a predetermined limit. This effectively precludes the feeder wheel 16 from causing a card to be crushed against the transport wheels. The velocity governor comprises a relatively large diameter wheel 42 which is rotatably mounted on feed shaft 26 by a suitable one way bearing 60 of a type similar to that which is utilized in connection with feed wheel 26.

An externally mounted and independently driven synchronous AC motor 34 has its outlet connected to pulley 36. Pulley 36 supports two belts 40 and 46. Belt 40 is connected to the circumference of the velocity governor wheel 42 for driving the same while belt 46 is connected to the circumference of pulley 48 to drive aforementioned shaft 23 and the transport wheels. If preferred, both pulleys and belts may be provided with meshing teeth to prevent slipping at high speeds. It should be noted that the synchronous motor is operable to drive both belts 40 and 46 so that the upper run of each belt moves from right to left. This imparts continuous counterclockwise rotation to the governor wheel 42 as illus-

trated in FIG. 4 and also to transport wheel 21 illustrated in FIG. 3. Referring to FIG. 4 it can be seen that feed shaft 26 rotates in the same direction as the governor wheel 42 and up to a maximum speed which is equal to that of the governor wheel. Thus, if the acceleration which is imparted to the shaft by the solenoid should cause its velocity to attempt to exceed that at which the governor wheel is moving, the rollers will be driven to the shallow portion of the slots thus causing the shaft to lock to the governor wheel so that there is no relative rotation between the two members. Thus, the cards are injected into the rollers at a precisely controlled velocity. Since the velocity governor wheel and motor rotor are substantially larger and much heavier than the drive shaft and feeder wheel their speed is limited to that at which the velocity governor is travelling.

Thus, what has been described is an apparatus for economically achieving a reliable and effective feeding device for selectively removing an end card from a deck of cards and feeding it to suitably provided transport wheels. The operation of the device comprises arranging a deck of cards 12 so that the lowermost card rests on a feeder wheel 16 of the type described herein and having the forward edge of the deck bearing against a metering guide 50. As indicated in FIG. 3 the guide should be so constructed so that the lowermost card in the deck can be moved forwardly past the lower surface of the guide. The device is started by first energizing the synchronous motor 34 so that the transport wheels are driven in the correct direction and the velocity governor wheel begins to rotate in a counterclockwise direction.

Then the rotary solenoid is energized to start reciprocating the movement of the feed shaft 26. From what has been said above it is apparent that during the first portion of the reciprocating movement of the feed shaft the feed wheel 16 is engaged thereby to drive the lowermost card 31 forwardly into the nip defined by the transport wheels. During the reverse portion of the shaft reciprocating movement the feed wheel 16 does not rotate.

If the velocity of the shaft should exceed a value which would cause crushing of the card in the nip defined by the transport rollers then the velocity governor is effective by virtue of the one-way bearing described above and illustrated hereinbefore to effectively limit the velocity of the feeder shaft to the velocity of the governor.

While the invention has been described with reference to a particular embodiment hereof it is apparent that many other forms and embodiments of this invention will be apparent to those skilled in the art in light of the foregoing description. Accordingly, the scope of the invention should not be limited

by the foregoing detailed description but rather only by the scope of the claims appended hereto.

I claim:

1. Apparatus for feeding cards from a deck comprising a shaft, a rotary solenoid connected to said shaft for intermittently reciprocating said shaft about its longitudinal axis, a feed wheel supported by said shaft for frictional engagement with the end card in a deck of cards, bearing means disposed intermediate said feed wheel and said shaft, said bearing means being operative to drivingly connect and disconnect said shaft and said feed wheel in response to the direction of rotation of said shaft so that during one portion of said reciprocating movement said wheel is driven by said shaft to feed said card, a velocity limiter wheel supported by said shaft, means for driving said velocity limiter wheel at a substantially constant velocity, and second bearing means disposed intermediate said velocity limiter wheel and said shaft, said second bearing means being operative to limit the velocity of said shaft when said shaft and said velocity limiter wheel rotate in the same direction.

2. Apparatus for feeding cards from a deck comprising feed wheel means supported for frictional engagement with an end card of a deck of cards, means for causing said feed wheel means to intermittently rotate thereby feeding such end card from said deck, means coupled to said feed wheel means for limiting the velocity of said feed wheel means to a predetermined maximum, and said last named means being operative to engage said feed wheel means when said feed wheel means exceeds said predetermined maximum.

3. Apparatus as defined in claim 2 wherein said feed wheel means includes a shaft, said shaft being supported for intermittent reciprocation about its longitudinal axis, means for intermittently reciprocating said shaft, a feed wheel supported on said shaft and being fixed to said shaft during the first portion of said reciprocation to feed said end card, and being rotatable relative to said shaft during the second portion of said reciprocation.

4. Apparatus as defined in claim 3 wherein said velocity limiting means comprises a rotatable member mounted on said shaft, said rotatable member being driven at a predetermined speed, and means intermediate said velocity limiting means and said shaft for limiting the velocity of said shaft so that it cannot exceed the velocity of said rotatable member.

5. Apparatus as defined in claim 4 including card transport means for receiving said end card from said feed wheel and being operative to move said card at least the speed it is driven at by said feed wheel.

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