July 1, 1969 K. A. COOK ET AL 3,452,983

STACKING DEVICE

Filed Sept. 1, 1967 Sheet 1 of 2

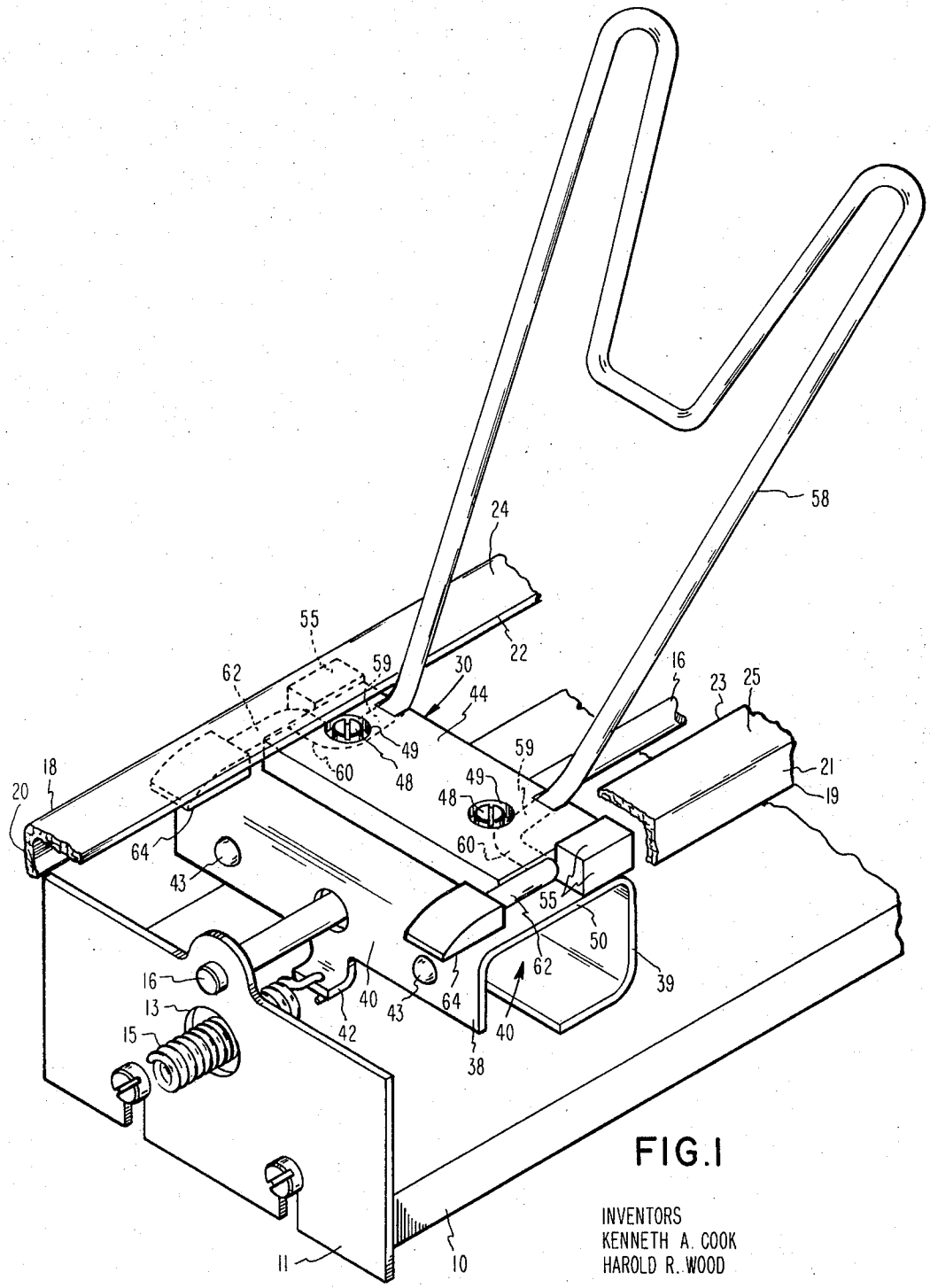

FIG. 1

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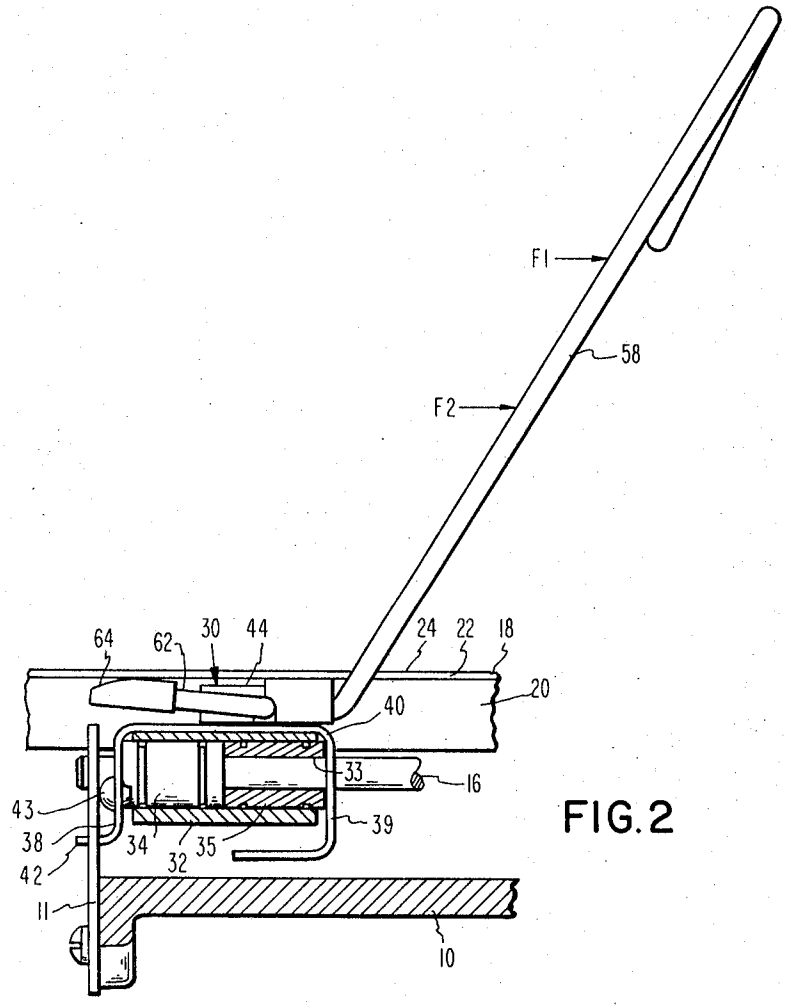

FIG. 2

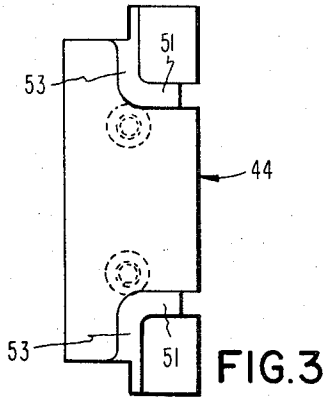

FIG. 3

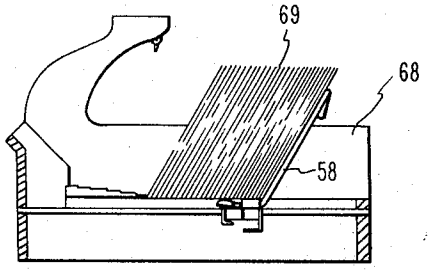

FIG. 4

United States Patent Office 3,452,983 Patented July 1, 1969

3,452,983

STACKING DEVICE

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Filed Sept. 1, 1967, Ser. No. 665,090
Int. Cl. B65h 31/06
U.S. Cl. 271—87 6 Claims

ABSTRACT OF THE DISCLOSURE

A device for stacking cards including a movable card deck support responsive to the effective center of gravity of cards received by the stacking mechanism to move incrementally in response to the number of cards received irrespective of the card length or the quantity of material punched from the card.

Background of the invention

This invention relates to card handling equipment and more particularly, to an improved device for stacking cards.

Card stacking devices commonly utilize a spring retained slidable card deck support to provide movement of the deck support for accommodation of the increase in the size of the card deck as cards are received in the pocket from a sorter or other card processing work station. Such a device is usually satisfactory when the cards being processed are of uniform size and weight, but is less than adequate when the cards of widely varying weight or center of gravity must be accommodated either because of substantially differing amounts of material punched therefrom or cards of different card size handled by the device.

If the return spring is too strong, short cards or warped longer cards do not provide sufficient force to move the support at a rate to properly accommodate the increasing card stack with the result that the card deck fans out at the top until the most recently received cards fall back in the stacker precluding these or additional cards from properly stacking. The solution or alternative to this condition is the use of a lighter biasing spring on the support. If this is done, the heavier, longer cards or a denser stack cause the support to move at too great a rate, causing the card deck to fall flat in the stacker which prevents cards from being correctly positioned in the stacker. A further problem encountered by prior art device is occasioned as the operator unloads cards from the pocket, particularly while the machine is running. If, as is probable, the operator instead of lifting a portion of the card deck from the pocket tends to draw the portion away from the machine during removal, the support is extended. Following removal of a portion of the cards, if the support does not return to a position to properly support the accumulating deck before the remaining cards fall, proper accumulation of the card stack ceases.

Summary

In the stacking device of the present invention, movement of the deck support is resisted by both a biasing spring and a friction brake which act in concert. The spring provides a uniform spring constant while the brake is associated with the deck support to sense the moment of the force exerted by the card deck and the effective height of the center of gravity to compensate for the card height and the decreased deck density caused either by card warpage or the amount of material punched from the card. This is accomplished by pivoting or loosely

mounting the movable card deck support and connecting a friction shoe device thereto which engages a stationary surface to provide an increased friction drag resisting movement of the support which supplements the spring biasing force and is responsive to the combination of the force exerted by the card deck and the effective distance of the force from the pivot access of the support. During the unloading operation of the pocket, if the operator exerts a force that would tend to extend the support, the torque exerted by the support forcing the friction shoe against the confronting surface tends to lock the support against outward motion and resist over extension. The card deck support is then in a position to be retracted quickly by the biasing spring to a position of proper support immediately upon removal of a portion of the card deck even when the remainder of the deck is unsupported as cards are removed.

It is an object of this invention to provide an improved card stacking device.

It is a further object of this invention to provide a card stacking device effective to handle a variety of card sizes without alteration or adjustment.

It is also an object of this invention to provide a card stacker that is effective to resist malfunction of the stacking operation when a portion of the card deck is removed.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

Brief description of the drawings

FIG. 1 is an isometric view of the card deck support of this invention and associated structure partly broken away and partly in phantom view.

FIG. 2 is a side elevation of the card deck support assembly of FIG. 1 partly broken away and partly in section.

FIG. 3 is a bottom view of the deck support housing member shown in FIG. 1.

FIG. 4 is a side elevation on a reduced scale of a stacking device including the deck support of FIG. 1 with portions broken away and partly in phantom view.

Detailed description

FIGS. 1 and 2 show a machine bed **10** to which is secured a stop plate **11**. Stop plate **11** has an aperture **13** through which a biasing spring **15** is permitted to pass and provides a fixed support for one end of the shaft **16**. Mounted on a housing wall (not shown) are a pair of guide rails **18** and **19** supported along vertical flanges **20** and **21** thereof, respectively, with inwardly extending horizontaly flanges **22** and **23** having upper surfaces **24** and **25** which define a card deck supporting surface and lower surfaces which are engaged by the card deck support assembly **30**.

The card deck support assembly **30** includes a cast bushing housing **32** with a longitudinally extending bore **33** in which are received a pair of bushings **34** and **35**. The bushings **34** and **35** are journaled about the shaft **16** and restrained against axial movement relative to housing **32** by the vertical wall portions **38** and **39** of a stop bracket **40** which are each apertured to permit the shaft to freely pass therethrough without restriction. A horizontally extending tab **42** is formed as an integral portion of bracket **40** and is apertured to receive one end of tension springs **15** which biases the assembly **30** toward the end plate **11**. Also carried by the wall portion **38** are a pair of grommets **43** which provide resilient abutment surfaces when the assembly **40** is urged against the end plate **11**.

The deck support housing member **44** is secured in overlying relation to the upper horizontal wall portion **50** of stop bracket **40** by a pair of bolts **48** that have the heads thereof received in cylindrical recesses **49** and shanks that extend through apertures in slide **44** and bracket top wall **50** to be received in threaded bores in the bushing housing **32** to interconnect the slide, bracket and housing. As seen in the bottom view of FIG. 3, the support housing **44** has a pair of L-shaped channels **51** formed at either side with aligned transversely extending portions **53**. The slide presents horizontal and vertical guide surfaces **55** which cooperate with guide rails **18** and **19** to guide movement of the assembly **30** along the shaft **16**.

A card deck support **58** is formed of a continuous rod with longitudinal portions **59** and transversely extending portions **60** disposed in the L-shaped channels **51** to retain the card deck support **58** captive as a part of assembly **30**. The terminal ends **62** of the rod forming the support **58** each carry a friction shoe **64**. The card deck support **58** is loosely retained between slide **44** and bracket **40** to permit the support to pivot about the common axis of transverse portions **60** to bring the friction shoes **64** into engagement with the lower surfaces **66** of guide rail flanges **22** and **23**.

As seen in FIG. 4, the cards are received in the pocket **68** to form a deck **69** supported by the support brackets **58**. As the deck size increases, the support **58** progresses to the right by an incremental external force applied to the lower portion of the deck, viewed in FIG. 4, resisted by the combined action of the spring constant of tension spring **15** and the frictional restraint of the friction shoes **64** engaging the guide rails **18** and **19**. By this combination of the restraining forces, the movement of the card deck support **58** adjusts to properly accommodate cards of differing lengths. For example, an 80 column punched data card would exert a horizontal force component acting through its center of gravity as indicated in FIG. 3 as F1 and a shorter 51 column punched data card would exert a lesser horizontal force component F2 through a center of gravity at a lower effective height. Although the cards require the same progression of the deck support per card, the marked difference in the force exerted by the longer cards as contrasted with the shorter cards requires that the effective restraining force be variable for proper operation. It is preferable that compensation be automatic rather than adjustable by the operator. The effective drag of the friction shoe **64** results not only from the size of the card deck and the magnitude of the horizontal force component but also the length of the moment arm through which the horizontal force components are exerted about the pivot axis established by the deck support transverse portion **60**. This moment is equivalent to the product of the force exerted between the shoes and the guide rail and the effective distance from the pivot axis. Accordingly, the resistance to movement of the deck support is proportional to the length of the card handled. This adjustment also is effective to compensate for the change in card mass in cards of identical overall length occasioned by the occurrence of heavily punched cards or relatively unpunched cards.

Further, when an operator is unloading a machine, which is commonly done during operation, it is easy to apply a substantially horizontal force tending to move the deck support horizontally outward. This frees the cards for removal, but if the remainder of the deck is not otherwise supported, it will tend to fall flat on the guide rails before the deck support can be returned by the biasing spring to properly support the remaining deck. Using the deck support illustrated and described herein an operator inadvertently exerting a horizontal force on the top of the deck support during unloading would tend to apply the force with a large effective movement arm above the axis of rotation of the deck support which would generate a large magnitude force between the shoe **64** and guide rails **18** and **19** which would resist or prevent any substantial movement of the deck support **58**. Consequently, the possibility of malfunction of the stacking operation is minimized.

What is claimed is:

1. In a stacking device for cards or the like including a receptacle having an upright card receiving channel with a base member at the bottom thereof and card deck support means within said receptacle for supporting a card deck in a generally vertical attitude on said base member at a slight inclination away from the direction of card entry, the improvement comprising:

means, including variable force restraining means, for permitting longitudinal movement of said card deck support means in response to increasing thickness of said card deck,

wherein said card deck support means includes a deck support member having a first portion engageable with said card deck and said restraining means includes a friction shoe carried by said deck support member and engageable with a stationary surface of said receptacle.

2. The stacking device of claim **1** further comprising a guide structure forming a portion of said receptacle;

a slide movable horizontally on said base,

said deck support member being pivotally connected to said slide about a horizontal axis; and

said friction shoe is carried by a second portion of said deck support member at the opposite side of said pivotal connection with respect to said first portion and engageable with said guide structure.

3. The stacking device of claim **2** further comprising biasing means restraining said longitudinal movement of said card deck support member, wherein said deck support member first portion engages a major surface of said card deck and said guide structure provides an upper horizontal card supporting surface and a lower horizontal surface engageable by said friction shoe, whereby said biasing means and the restraint exercised by the frictional contact between said shoe and said guide structure are additive to resist longitudinal movement of said slide and said card deck support member.

4. In a stacking device for cards or the like including a receptacle having an upright card receiving channel with a base member at the bottom thereof, card deck support means within said receptacle for supporting said cards in a generally vertical attitude on said base member at a slight inclination away from the direction of card entry and means biasing said card deck support means toward an unloaded position, the improvement comprising:

variable force restraining means additive to said biasing means for resisting movement of said card deck support means wherein a resisting frictional force increases with the height of the effective force applied by the inclined card stack against said card deck support means, whereby movement of said deck support means is proportional to the thickness of said card deck irrespective of the height of the cards or the varying center of gravity caused by material being punched from the card.

5. The stacking device of claim **4** wherein said card deck support means includes a deck support member mounted on said receptacle for longitudinal sliding movement with respect thereto and engageable with said card deck inclined surface and said restraining means comprises a friction shoe carried by said deck support member and engageable with a generally horizontal surface of said receptacle.

6. The stacking device of claim **4** wherein said base includes a guide rail along each lateral side of said receptacle, each said guide rail presenting upper and lower longitudinally extending surfaces;

said deck support means comprises a slide member carried by said receptacle for longitudinal sliding movement along said lower surfaces of said guide

rail and a support member formed of a continuous rod having an upwardly extending card deck support portion, transversely extending leg portions loosely pivoted in recesses formed in said slide member and longitudinally extending distal ends respectively underlying said guide rail lower surfaces; and

said restraining means comprise a pair of friction shoes respectively carried by said support member distal ends and engageable with said guide rail lower surfaces to resist pivoting of said card deck support portion beyond a predetermined inclination.

References Cited

UNITED STATES PATENTS

3,066,933 12/1962 Fiehl ---------- 271—87

EDWARD A. SROKA, *Primary Examiner.*

U.S. Cl. X.R.

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