Feb. 28, 1967 HANS-DIEDRICH BEUCK 3,306,609

STACK-FORMING CONVEYOR DEVICE FOR DATA CARDS

Filed Feb. 24, 1965

3 Sheets-Sheet 1

Fig. 1

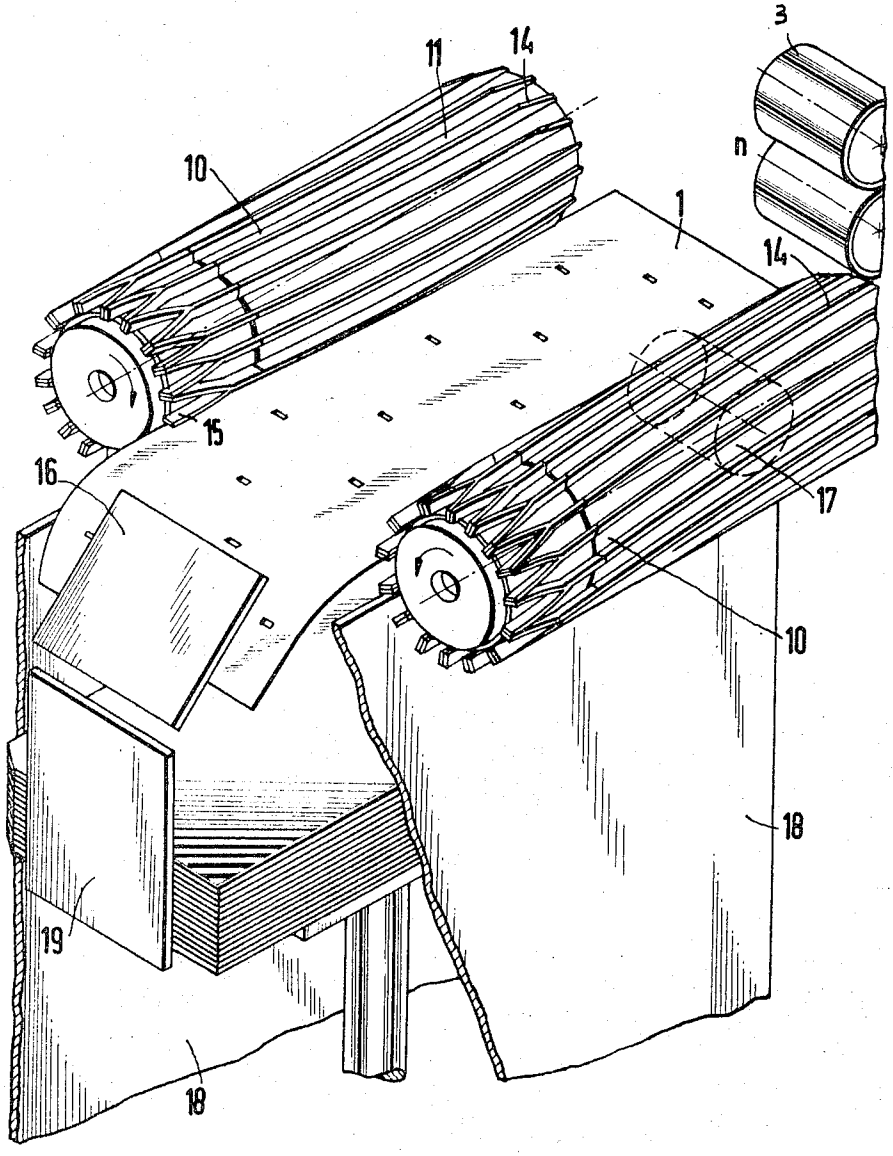

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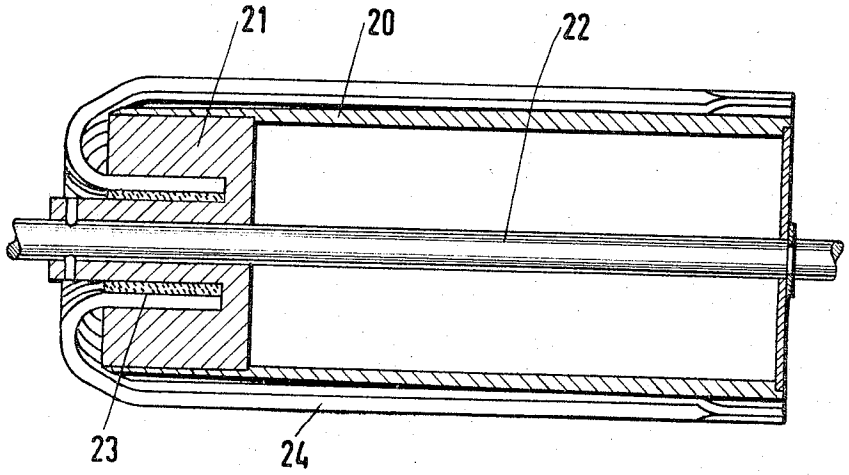
Fig. 2



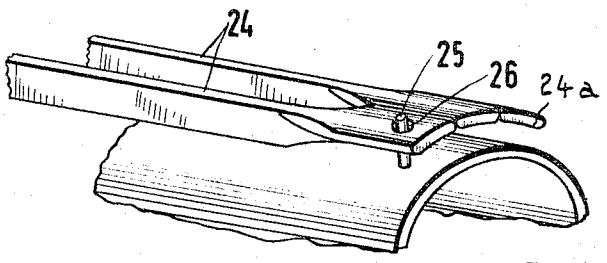


Fig. 2a

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3 Sheets-Sheet 3

Fig. 3

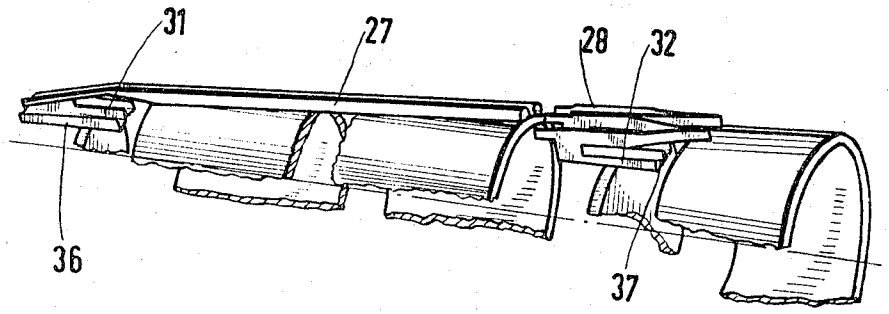


Fig. 4

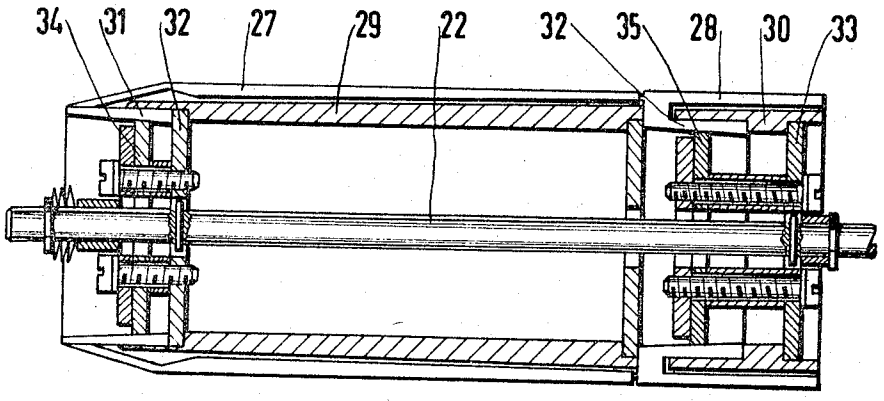
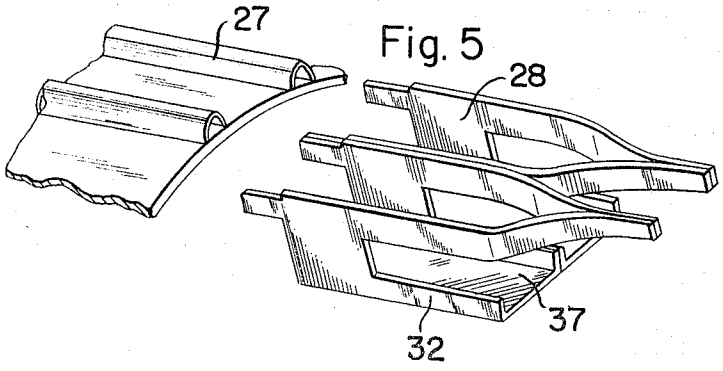


Fig. 5



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3,306,609

STACK-FORMING CONVEYOR DEVICE FOR DATA CARDS

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Claims priority, application Germany, Feb. 24, 1964, S 89,654
10 Claims. (Cl. 271—71)

My invention relates to devices for conveying and stacking of card-shaped data carriers which arrive in a sequence and are to be stacked onto one another in a lay-off compartment, collecting box or the like.

In data processing equipment operating with punched cards or other card-shaped data carriers, there is the problem of reliably placing such data carriers without damage into the lay-off compartment despite the fact that the cards are being conveyed to the lay-off location at a high travelling speed. Simply decelerating the travelling cards shortly before they arrive at the lay-off location does not solve the problem. This is because, for highest operating speed of the equipment at a given conveying speed of the cards, the distance between the successive cards must be kept small, but then the cards hit against the decelerated preceding cards thus causing damage to the cards, or clogging and other faulty operation.

To avoid such trouble, it has become known from U.S. Patent No. 3,223,409, to E. Eissfeld et al., to provide a conveying and stacking device for data cards with means for deflecting the cards out of the plane of arrival onto the stack or lay-off location, these deflecting means comprising two stack-forming rollers whose respective axes extend substantially parallel to the lateral sides of the card-travel path and which rotate in mutually opposed directions. The two rollers are provided with longitudinal slots extending along the peripheral surfaces and following each other around the periphery. Each arriving card runs into one of the slots of each roller and is then deflected downward by rotation of the two rollers. Each subsequently arriving card enters into another slot of each roller. In this manner the cards are reliably stacked without the danger that the leading edge of the card may abut against the rear edge of the preceding card. In a preferred embodiment of this device, each slot is provided with braking means for decelerating the cards as they pass through the stacking rollers. The walls of the slots run slightly askew, for example helically, so that a card shooting into a slot is guided on its entire slot path in parallel relation to the axes of the stacking rollers and substantially at the height of these axes, thus affording the assurance that each card is held on both sides along the full axial length of the slots.

The present invention more particularly relates to a stack-forming card-conveying device of the latter type and has for its main object to improve such devices so as to afford the possibility of varying and adjusting the helical pitch or inclination of the slot walls on the stacking rollers for adaptation to a particular card travel speed and/or to the rotating speed of the stacking rollers.

Another object of my invention, relating to stack-forming conveying devices of the above-mentioned type, is to simplify and improve the manufacture of the stacking rollers and to secure a more reliable frictional braking action for decelerating the cards as they reach the end of their travel in the slots of the stacking rollers.

To achieve these objects, and in accordance with one of the features of my invention, I provide each of the two parallel stacking rollers of the card conveying device with an axially elongated roller body and with a number of elongated bars which extend lengthwise of the body so as to form respective lateral walls of the above-mentioned guide slots, each bar having an elastically yieldable portion of the rear end relative to the card travel direction; and the rear end portions of peripherally adjacent bars extend toward each other and thereby form a card-decelerating friction brake. Furthermore, each bar is fastened to the roller body at only two localities, namely at the front end and the above-mentioned rear end portion respectively.

The above-mentioned and further objects, advantages and features of my invention, said features being set forth with particularity in the claims annexed hereto, will be apparent from, and will be described in, the following with reference to embodiments of devices according to the invention illustrated by way of example on the accompanying drawings, in which:

FIG. 1 is a perspective view of a card-stacking conveyor device, shown partly schematically.

FIG. 2 is an axial section of a stacking roller; and FIG. 2*a* shows a perspective view of a detail corresponding to FIG. 2.

FIG. 3 is an exploded perspective view of a different, partially illustrated stacking roller; and

FIG. 4 is an axial section of the stacking roller according to FIG. 3.

The device shown in FIG. 1 corresponds to the one illustrated in FIG. 5 of the above-mentioned patent (Serial No. 256,171); and it appears helpful to first describe this device, since devices according to the invention may have fundamentally the same design and performance with the exception of the features relating to the appertaining two stacking rollers which are to be modified as exemplified by the embodiments shown in FIGS. 2, 2*a* and FIGS. 3, 4 respectively.

Referring to FIG. 1, the data card **1** arrives from the right at relatively high conveying speed, being driven by a pair of pinch rollers **3** rotating at the peripheral speed *n* so as to enter between two stacking rollers **10** whose respective axes are parallel to each other and to the card travel path. At the arrival moment of the card **1**, two of the longitudinal slots of the respective rollers **10** are located opposite each other and are engaged by the respective longitudinal edges of the travelling card **1**. Braking means at the ends of the slots **11**, consisting of pairs of leaf springs **15** pressing against each other, decelerate the cards as they enter between the leaf springs. The two stacking rollers **10** rotate in mutually opposed directions and displace the card **1** downwardly as soon as it has entered into the respective slots. The card then drops out of the slots into a lay-off magazine. To secure a satisfactory release of the decelerated cards from the stacking rollers **10** and to prevent edging of the cards due to non-simultaneous release of the cards from the leaf springs **15**, the device is provided with an inclined guide sheet **16** spaced forward from the stacking rollers and located approximately at the height of their axes. The front edge of each arriving card **1** hits against the inclined guide sheet **16** and is thereby deflected downwardly so that it enters between the side walls **18** of the magazine before the rear end of the card is released from the stacking rollers **10**. For obtaining a properly aligned stack of cards, the device is provided with another driven roller **17** which, when the released card drops upon it, drives the card forward until the front edge of the card abuts against the front wall **19** of the magazine.

According to the embodiment of the invention exemplified in FIGS. 2 and 2*a*, each stacking roller **10** (FIG. 1) comprises a tubular roller body **20** which is closed by a massive disc **21** at its front end, this being the axial end at which the card first arrives. The roller body is concentrically mounted on a drive shaft **22**. The front

disc **21** of the roller has on the card-entering side an annular groove **23** concentric to the axis of the shaft **22**. The roller is further provided with a number of bars consisting for example of spring steel. These bars form respective lateral walls of the above-mentioned card-guiding grooves **11**. As shown in FIG. 2, the front portion of each bar **24** is curved to a U-shaped configuration. The shorter U-leg forms the front end of the entire bar and is inserted into the above-mentioned annular recess **23** and fastened therein by a casting consisting, for example, of solder or cementing material.

The bars **24** extend on edge along the outer periphery of the rotor body **20** so as to form the slots **11** between each other. Along the major portion of its length, each bar has an elongated, rectangular cross section standing on edge; that is, the longitudinal dimension of the cross section extends radially with respect to the roller body. At the rear end, the upright cross section merges gradually with a broad and flat cross section. The flat rear ends of the bars are elastically in contact with each other in a peripheral succession concentric to the axis of the rotor body. As long as no card enters between two adjacent rear ends, these ends will touch or substantially touch each other, but a travelling card will force the ends apart and thus be subjected to braking friction. To stabilize the localities of the flat rear ends **24***a*, particularly with respect to excessive tangential displacements, the tubular body **20** of the roller is provided with pins **25** at a few angularly spaced localities. The pins **25** protrude in the radially outward direction and pass through respective bores **26** in the broad and flat rear ends of the respective bars **24**. The bores **26** have a larger diameter than the pins to provide for some clearance.

The bars **24** preferably consist of a single integral body inclusive of their front and rear ends. The material of the bars is sufficiently elastic and is so pretensioned that the bars have the tendency to place themselves radially against the tubular body **20** of the roller. As a result, the rear ends of the bars **24** normally will touch each other in a peripheral succession, and at each point of engagement there obtains an elastical force in the tangential direction. This force is available as frictional force for decelerating a card penetrating between the two adjacent rear ends **24***a*.

By selecting the angular position of the tubular body **20** relative to the disc **21**, the bars **24** can be given a desired inclined position along a helical line. The tubular body **20** and the disc **21** are then to be fixed to each other in the selected angular relationship, for example by means of a set screw (not shown) passing radially through the wall of the tubular body **20** into the disc **21**. The angular position corresponding to a desired slight helical pitch may be adjusted by the manufacturer in accordance with particular data processing equipment with which the card conveying and stacking device is to be used, this position to be then permanently preserved by rigidly joining the tubular body **20** and the disc **21** together. However, the angular position may also remain adjustable to permit changes in an angular setting during use of the conveying device, for example in conjunction with changes in proecssing or conveying speed.

The embodiment of the stacking rollers shown in FIGS. 3 and 4 is provided with bars **27** individually cut and bent from sheet metal and joined with separately cut and shaped rear end portions **28**, also consisting of sheet metal. The tubular body **29** of the stacking roller is subdivided so as to comprise a separate rear portion **30** for accommodating the rear-end portions **28** of the longitudinal bars **27**. The bars **27** constitute jointly the longitudinal guide slots of the stacking roller. Each bar **27** has a U-shaped cross section open toward the roller body. The forward end of each sheet-metal bar, this being the end where the card first arrives, is curved to an inwardly extending shape so as to form a hook-like extension **31** which is hung over the edge of the tubular body **29** and abuts against

a disc **32'** resting against an inner peripheral shoulder of the tubular rotor body **29**.

The end portions **28**, made of spring metal, are stuck into the rear ends of the bars **27** (FIG. 3*a*) so that the bars and the end portions **28** lie flush with each other at the junction location to secure a smooth travel of the cards. The end portions **28** are likewise provided with a hook-shaped extension **32** with which they are hung over the edge of the annular body **30** and abut against an inner peripheral shoulder thereof.

The tubular body **29** and the annular body **30** of the stacking rotor are fastened on the roller shaft **22** by means of the above-mentioned disc **32'** and another terminal disc **33**. Respective further discs **34** and **35** are tightened by bolts against the respective discs **32'** and **33**, thus clamping the hook-shaped extensions of bars **27** and end portions **28**, these extensions having a conical or wedge-like shape, against the respective bodies **29** and **30**. This is apparent from the section shown in FIG. 3.

The hook-shaped extensions **31** have respective lateral lugs **36** (FIG. 3) which serve as spacers to secure the correct distance from the adjacent bar. Analogously, the proper distance between the resilient end portions **28** is secured by having them pairwise interconnected through a bridging member **37**, each bridge extending over one bar division on the side of the hook **32** facing the rotor axis.

By changing the angular position of the ring-shaped body **30** relative to the tubular body **29**, the bars **27** can be given the desired helical pitch in order to utilize the entire height of the bars **27** for guiding the card edges and utilizing the entire elastic width of the end portions **28** for decelerating the cards. The adjusting and fixing of the angular position is effected in the manner already described with reference to FIGS. 2 and 2*a*.

To those skilled in the art it will be obvious upon a study of this disclosure that my invention permits of various modifications and may be given embodiments other than particularly illustrated and described herein, without departing from the essential features of the invention and within the scope of the claims annexed hereto.

I claim:

1. Conveying device for stacking data cards which arrive in succession, comprising conveying means defining an entering plane for arriving cards, two parallel stacking rollers of mutually opposed directions of rotation mounted behind said conveying means along opposite sides respectively of the card conveying path in said entering plane, each of said rollers having an axially elongated roller body with peripherally distributed longitudinal slots engageable by respective lateral edges of the cards coming from said conveying means, respective bars extending lengthwise of said body and forming respective lateral walls of said slots, said bars having respective elastically yieldable rear ends extending toward each other and forming a card-decelerating brake and being fastened to said roller body at the front and rear ends only, said bars consisting of springy material and having with the exception of said rear ends, a radially elongated cross section which gradually merges with a radially flatter and peripherally wider cross section at said rear ends, said rear ends being located against each other in peripheral succession on a circle concentric to the axis of said roller body.

2. Conveying device for stacking data cards which arrive in succession, comprising conveying means defining an entering plane for arriving cards, two parallel stacking rollers of mutually opposed directions of rotation mounted behind said conveying means along opposite sides respectively of the card conveying path in said entering plane, each of said rollers having an axially elongated roller body with peripherally distributed longitudinal slots engageable by respective lateral edges of the cards coming from said conveying means, respective bars

extending lengthwise of said body and forming respective lateral walls of said slots, said bars having respective elastically yieldable rear ends extending toward each other and forming a card-decelerating brake and being fastened to said roller body at the front and rear ends only, said roller body having a recessed front portion, said bars having respective U-shaped front portions with the shorter U-leg extending in the inward direction and forming the front end of said bar, said front ends of said bars being located and anchored in said recessed front portion of said roller body.

3. In a data-card conveying device according to claim 1, said flat rear ends of said bars having respective openings, radial pins fastened to said roller body and extending through said respective openings and having a smaller diameter than said openings for limiting tangential displacements of said rear ends of said bars.

4. Conveying device for stacking data cards which arrive in succession, comprising conveying means defining an entering plane for arriving cards, two parallel stacking rollers of mutually opposed directions of rotation mounted behind said conveying means along opposite sides respectively of the card conveying path in said entering plane, each of said rollers having two coaxially aligned portions jointly forming an axially elongated roller body and angularly adjustable and fixedly attachable to each other, bar structures extending along said roller body and being peripherally spaced from each other on said body to form interstitial guide slots engageable by respective lateral edges of the cards coming from said conveying means, each of said bar structures having respective end portions secured to said two roller portions, whereby different angular adjustments between said roller portions correspond to respectively different amounts of helical pitch of said guide slots.

5. Conveying device for stacking data cards which arrive in succession, comprising conveying means defining an entering plane for arriving cards, two parallel stacking rollers of mutually opposed directions of rotation mounted behind said conveying means along opposite sides respectively of the card conveying path in said entering plane, each of said rollers having two coaxially aligned portions jointly forming an axially elongated roller body and angularly adjustable and fixedly attachable to each other, bar structures extending along said roller body and being peripherally spaced from each other on said body to form interstitial guide slots engageable by respective lateral edges of the cards coming from said conveying means, said bar structures having respective elastically yieldable rear ends extending toward each other and forming a card-decelerating brake, and said bar structures being fastened at said respective rear ends to one of said roller portions and at the respective front ends to said other roller portion, whereby different angular adjustments between said roller portions correspond to

respectively different amounts of helical pitch of said guide slots.

6. In a data-card conveying device according to claim 5, each of said bar structures being bifurcated at said rear end and having its two fork legs spread apart into elastic engagement with respective legs of the adjacent bar structures.

7. In a data-card conveying device according to claim 5, each of said bar structures having hook-shaped extensions at both ends respectively, said extensions having an inwardly and re-entrantly curved shape and being in clamping engagement with one of said respective roller portions.

8. In a data-card conveying device according to claim 5, each of said bar structures having lateral extensions engageable with respective adjacent bar structures and forming spacers for holding said bar structures peripherally positioned relative to each other.

9. In a data-card conveying device according to claim 7, said hook-shaped extensions having lateral lugs engageable with respective adjacent bar structures and forming spacers for holding said bar structures peripherally positioned relative to each other.

10. Conveying device for stacking data cards which arrive in succession, comprising conveying means defining an entering plane for arriving cards, two parallel stacking rollers of mutually opposed directions of rotation mounted behind said conveying means along opposite sides respectively of the card conveying path in said entering plane, each of said rollers having two coaxially aligned portions jointly forming an axially elongated roller body and angularly adjustable and fixedly attachable to each other, bar structures extending along said roller body and being peripherally spaced from each other on said body to form interstitial guide slots engageable by respective lateral edges of the cards coming from said conveying means, bifurcated end members shorter than said bar structures and articulately linked with said respective bar structures to form the rear end portions thereof, each of said members having two fork legs spread apart into elastic engagement with respective legs of the adjacent bar structures, the extremities of said legs being fastened to one of said roller portions and the opposite ends of said bar structures being fastened to said other roller portion, whereby different angular adjustments between said roller portions correspond to a respectively different amount of helical pitch of said guide slots.

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3,223,409 12/1965 Eissfeld et al. ---------- 271—71

M. HENSON WOOD, JR., *Primary Examiner.*

J. N. ERLICH, *Assistant Examiner.*