July 7, 1970 E. J. BLAKE ET AL 3,519,266

PAPER SHEET CONVEYING MECHANISMS

Filed March 29, 1968 3 Sheets-Sheet 1

Fig. 1.

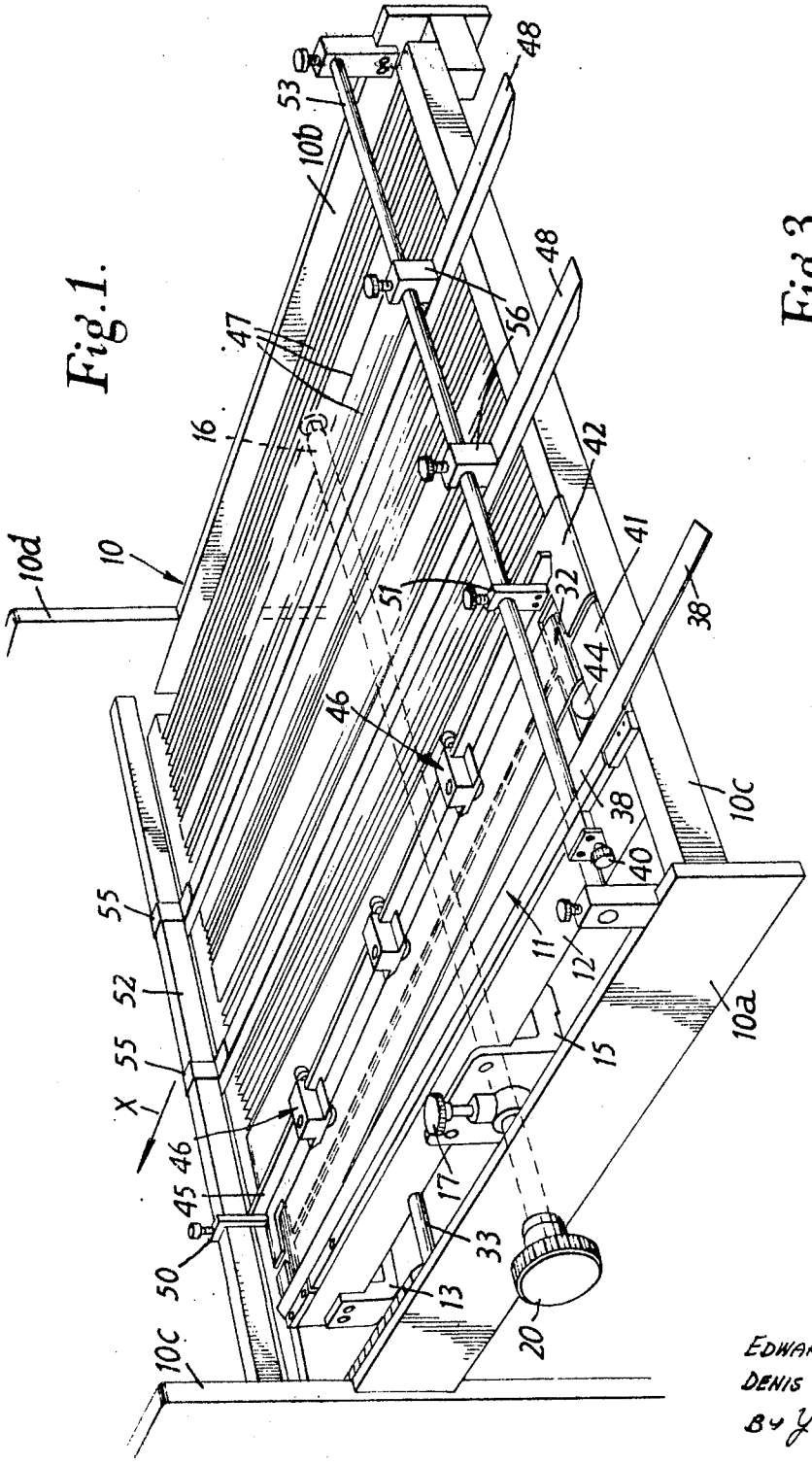
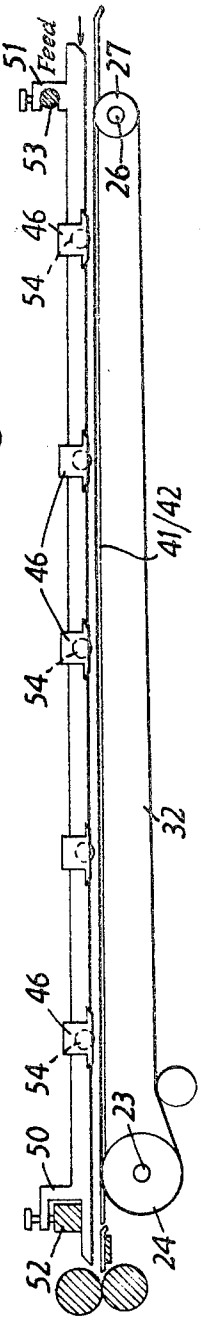


Fig. 3.



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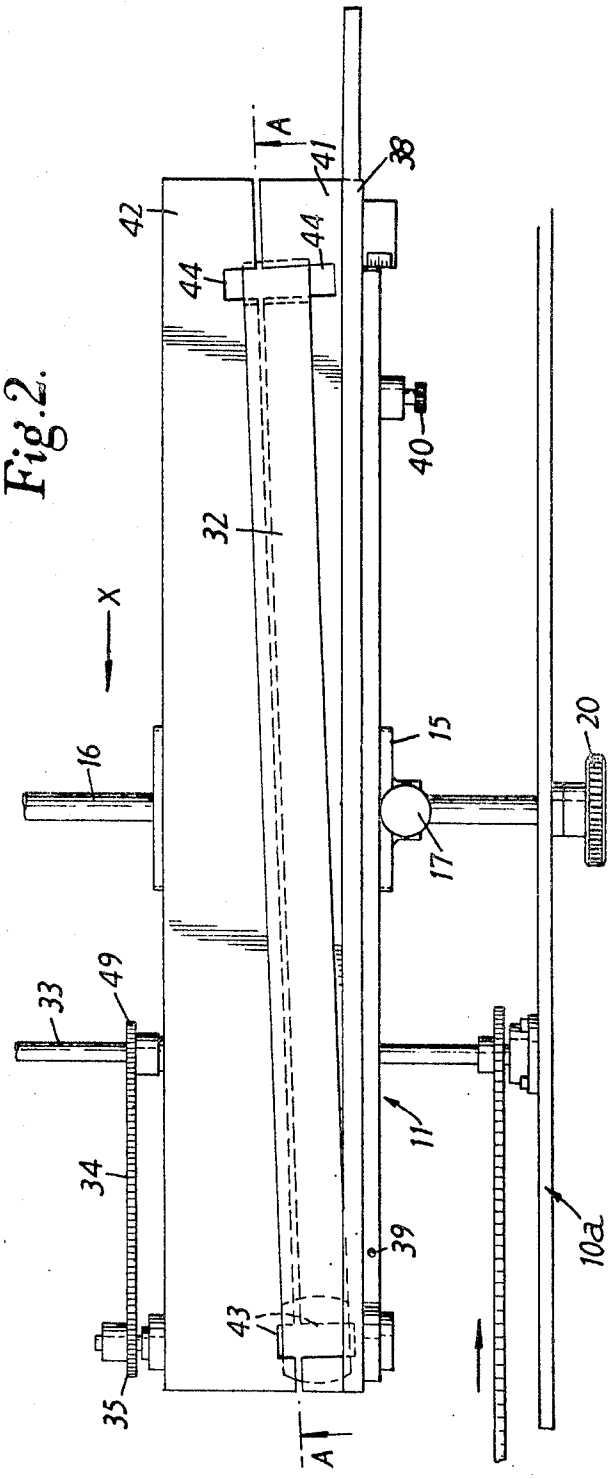
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Fig. 2.



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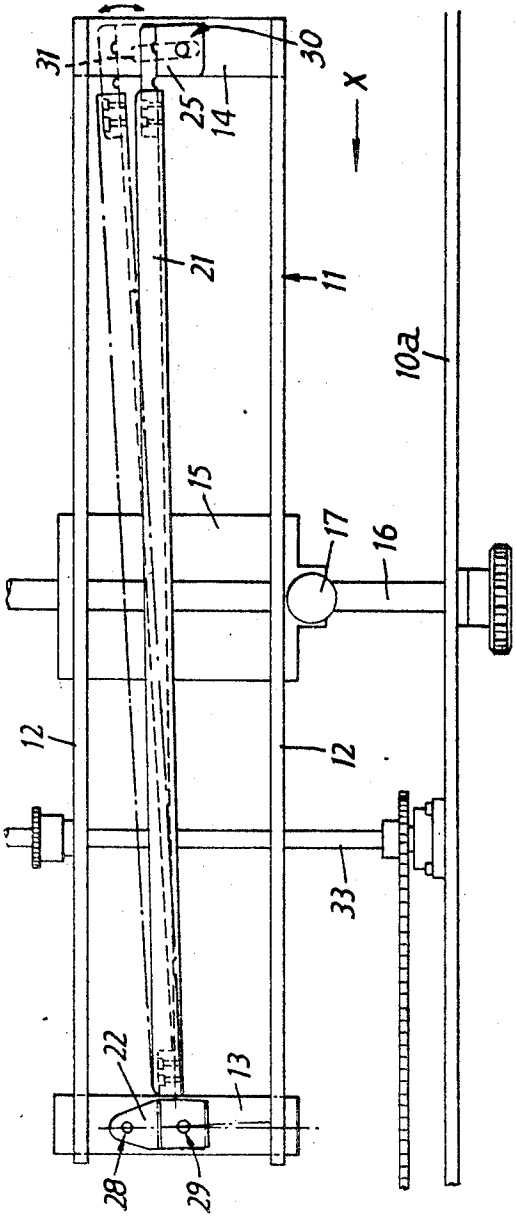


Fig.6.

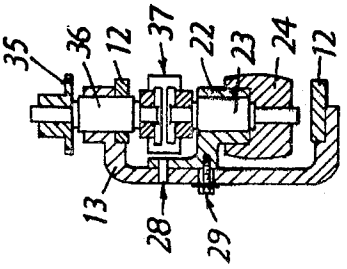


Fig.5.

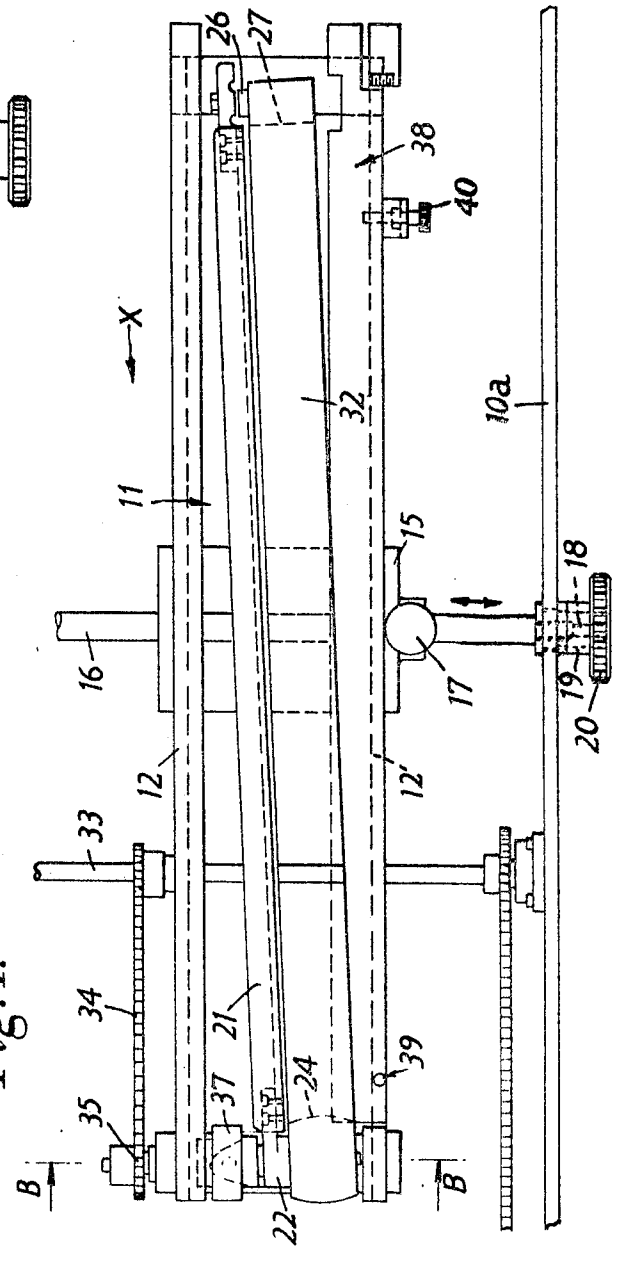


Fig.4.

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PAPER SHEET CONVEYING MECHANISMS

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Int. Cl. B65h 9/14
U.S. Cl. 271—49 8 Claims

ABSTRACT OF THE DISCLOSURE

Paper sheet feeding table comprising an endless feed belt extending longitudinally of the table with its upper run in the horizontal plane of other sheet support means, such as transverse rollers or longitudinal slide strips and a stationary side lay plate extending longitudinally to define sheet conveyance direction, said feed belt being arranged so that its angle of inclination relative to said side lay plate can be varied. The side lay plate and the feed belt are mounted in a carriage movable transversely to the sheet feed direction.

This invention relates to paper sheet conveying mechanisms and is more particularly concerned with the construction of paper sheet feeding tables for use in conjunction with paper sheet folding, printing and like machinery.

It is already well known to construct paper sheet feeding tables in which a plurality of similar constant diameter rolls are disposed parallel with one another with their axes in a common horizontal plane and each at a slight angle to the direction which is perpendicular to the sheet feed direction along the table. The rolls extend across the full width of the table and are arranged to be driven at the same peripheral speed whereby the paper sheet is carried forwardly by contact with the upper surfaces of the rotating rolls and is simultaneously urged sideways into contact with a stationary side lay plate which extends in and defines the longitudinal sheet feed direction.

It is also known to use, instead of inclined rolls extending across the full width of the feed table, a similar series of shortened and inclined rolls which are disposed immediately adjacent the side lay plate, and are mounted, with the latter, upon a carriage which is moveable transversely across the table, the remainder of the conveyance area of the table being provided with spaced stationary support strips disposed parallel with the sheet feed direction.

It is also known to use, in place of the last-mentioned series of shortened rolls, an endless feed belt disposed with its length dimension set at a small fixed angle to and adjacent the said side lay plate, the upper run of such belt being in the same plane as the top surfaces of the support strips and serving to make contact with and drive the overlying paper sheet both in the desired feed direction and also to urge it sideways into contact with the side lay plate.

The increased speeds of operation of modern paper sheet machinery demand increased accuracy of sheet conveyance both as regards precision of the sheet conveyance direction and the positioning of the sheet transversely to its conveyance direction.

Objects of the invention include the provision of an improved form of construction of a sheet feeding table providing enhanced accuracy of sheet feeding direction and positioning with paper sheets of widely different characteristics such as weight and stiffness and with a wide range of conveyance speeds.

According to the invention a paper sheet feeding table of the type comprising an endless feed belt extending longitudinally of the table with its upper run lying in the horizontal plane of other sheet support means, such as a plurality of stationary support strips disposed parallel with the sheet conveyance direction, said upper feed belt run being disposed at a small angle to a stationary side lay plate extending in and defining the sheet conveyance direction, is characterized by the provision of means whereby the angle of inclination of said upper run of said feed belt to said side lay plate is capable of variation over a predetermined range of angular values.

The nature of the invention will be better understood from the following description of one practical embodiment given by way of illustrative example and with reference to the accompanying drawings wherein:

FIG. 1 is a fragmentary perspective view of a sheet feeding table embodying the invention,

FIG. 2 is a plan view of part of the table shown in FIG. 1.

FIG. 3 is a longitudinal section taken on the line A—A of FIG. 2.

FIG. 4 is a plan view, similar to FIG. 2 but with parts removed.

FIG. 5 is a transverse sectional view taken on the line B—B of FIG. 4, while

FIG. 6 is another plan view, similar to FIG. 4, but with further parts removed.

In the illustrated embodiment, and as shown more particular in FIG. 1, the stationary feed table structure indicated generally at **10** comprises side frame plates **10***a*, **10***b* held in parallel relationship by means such as transverse bars **10***c*. Such frame plates **10***a*, **10***b* may form part of or be rigidly secured to the side frame plates **10***d* of an associated machine such as a sheet folding machine. The structure **10** supports a carriage **11**, shown more clearly in FIG. 6, comprising horizontal side limbs **12** held in parallel spaced-apart relationship by brackets **13** and **14** at each end and by a middle bracket **15**. The carriage **11** is supported for movement bodily transverse to the sheet feed direction *x* of the table upon support means which include a central rod **16** mounted in the side plates **10***a*, **10***b*. The carriage **11**, although slidable along the rod **16**, can be rigidly clamped thereto at any desired transverse position by means of a clamp screw **17**. Such sliding and clamping arrangement constitutes only a coarse adjustment of the transverse position of the carriage **11**, fine adjustment of such transverse positioning being provided by the engagement of a screw-threaded extension **18** of one end of the rod **16** within a captive nut **19** (FIG. 4) rotatable in the side frame plate **10***a* of the table. Such nut **19** is provided with an manual control knob **20**. The opposite end of the rod **16** is freely slidable in the opposite frame plate **10***b*.

Between the side limbs **12** of the carriage **11** is disposed a support bar **21** provided at one end with a first bearing bracket **22** carrying a horizontal spindle **23** (FIG. 5) to which is attached a first belt pulley **24**. A second bearing bracket **25** at the opposite end of the support bar carries a horizontal spindle **26** upon which is mounted a second belt pulley **27**. The bearing bracket **22** is pivotally connected to the end bracket **13** by means of a vertical pivot pin **28** whose axis, when projected, intersects that of the spindle **23**. A clamping screw **29** carried by the bracket **22** and operating in an arcuate slot in the bracket **13** permits securing of the bracket **22** and the attached support bar **21** in any desired angle of inclination with respect to the direction *x* within the range set by a further clamping bolt **30** carried in the opposite bearing bracket **25** and

operating within an arcuate slot **31** in the end bracket **14**.

An endless feed belt **32** (seen more clearly in FIGS. 2, 3 and 4) extends around the two pulleys **24, 27** and is arranged to be continuously driven from a drive shaft **33** which extends between and is journaled in the side frame plates **10***a*, **10***b* of the table. The drive to the belt **32** is by way of an endless chain **34** (see particularly FIG. 4) from a sprocket **49** on the drive shaft **33** to a further sprocket **35** rigid with a short stub shaft **36** rotatably mounted in a bearing bushing integral with the end bracket **13**. The inner end of this stub shaft is in driving connection with the spindle **23** of the belt pulley **24** through a suitable flexible coupling **37** in order to allow for slight angular displacement of the axis of the spindle **23** relative to the stub shaft **36**. The sprocket **49** is arranged to be slidable along the shaft **33** while being maintained in driving connection therewith.

On the side limb **12** of the carriage **11** nearest the side frame plate **10***a* of the table is mounted a side lay plate **38** including a strip defining a groove of V-section facing towards the opposite frame plate **10***b*. The median plane of the V-section groove is horizontal and coincident with the conveyance plane of the paper sheets. This lay plate structure is pivotally mounted at the left hand end (see particularly FIG. 2) by a pin **39** while its opposite end is provided with screw adjusting means **40** to permit precise adjustment of the alignment of the lay plate with the desired feed direction.

A cover plate, made in two separate parts **41, 42** is mounted on the upper surfaces of the side limbs **12** of the carriage **11**, the upper surface of such cover plate being coincident with the plane of the underside of the upper run of the belt **32** whereby the latter is supported in a horizontal plane throughout its length. Appropriately shaped notches **43, 44** in the mutually facing edges of the two cover plate parts allow passage of the belt at each end around the supporting pulleys, the notches **44** at the righthand end being suitably extended in depth to accommodate angular adjustment movement of the belt upon movement of the support bar **21**.

A further and adjustable position bar **45** (FIG. 1) supported by hanger brackets **50, 51** upon transverse horizontal bearers **52, 53** above the belt **32** carries any desired number of separate, adjustable position, blocks **46** each accommodating a steel or other ball **54**. Such balls rest upon the upper surface of any paper sheet passing along the feeding table and serve to provide the required driving connection between the paper sheet and the moving belt **32** in known manner.

The conveyance area of the table between the outer edge of the cover plate part **42** and the opposite side frame plate **10***b* is provided with a plurality of stationary support strips **47**; these are conveniently of U-section and are made to be readily removable and adjustable in position. Additional sheet smoothing strips **48**, supported by hanger brackets **55, 56** on the bearers **52, 53**, are disposed above the sheet conveyance level over the belt and support strips.

As will be apparent from the description given, each paper sheet fed to the table beneath the smoothing strips **48** will be supported over its width in part by the upper surface of the upper run of the belt **32** and in part by the upper edges of the support strips **47**. The belt **32** is circulated continuously and the paper sheet, urged into frictional contact therewith by the weight of the balls **54** in the blocks **46**, will be driven forwardly. Owing to the angled positioning of the belt **32**, the driven paper sheet will simultaneously be urged gently sidewise to bring its lefthand edge into the V-notch of the side lay plate **38** whereby the sheet is accurately aligned and is conveyed forwardly into some succeeding machine or device with is feed direction accurately controlled. The position

of the sheet transversely of the table width is adjustable by movement of the carriage **11** bodily using the coarse and fine adjustments provided. This permits the sheet to be fed forward with an accurate positional relationship to some particular device, e.g. a knife folder blade, in the subsequent machine. The number and position of the support strips **47** may be altered as necessary in accordance with the size of sheet being handled.

The amount of sideways bias imparted to the paper sheet in order to maintain it in proper engagement with the side lay plate is controlled by the angular setting of the support bar **21** and the belt **32** carried thereby. The precise value of such sideways bias for satisfactory maintenance of contact of the moving sheet edge with the side lay without risk of buckling of the sheet adjacent such sheet edge is dependent upon the nature of the sheet material, e.g. its stiffness and weight, and other factors such as the sheet conveyance speed. The facility for adjustment of the angle of the feed belt allows precise setting to the optimum value for the particular task in hand at any time.

We claim:

1. A paper sheet feeding table comprising sheet support means, an endless feed belt extending longitudinally of the table with the upper surface of its upper run lying in the horizontal plane of the upper surface of said sheet support means, a stationary side lay plate extending in and defining the sheet conveyance direction, said upper feed belt run being disposed at an acute angle to said lay plate, and means to vary the inclination of said upper run of said feed belt to said side lay plate thereby selectively to adjust said angle.

2. A paper sheet feeding table in accordance with claim **1** wherein said endless feed belt is carried around rotatable pulleys supported by a rigid member which is swingably mounted for movement about a vertical pivot axis.

3. A paper sheet feeding table in accordance with claim **2** in which said rigid member is pivotally mounted at one end adjacent one belt pulley.

4. A paper sheet feeding table in accordance with claim **3** in which said endless feed belt is arranged to be driven by a drive connection to the pulley adjacent said mounting pivot.

5. A paper sheet feeding table in accordance with claim **4** in which a shaft carrying said belt pulley is connected through a flexible coupling to a further shaft rotatable about a fixed axis at right angles to the sheet feed direction.

6. A paper sheet feeding table in accordance with claim **1** in which said inclined belt and said side lay plate are both supported in a carriage which is adjustable bodily in a direction transverse to the sheet feed direction.

7. A paper sheet feeding table in accordance with claim **6** in which said carriage comprises a framework slidable on transverse support member, one of said members being itself moveable lengthwise within a fixed framework by fine position control means and said carriage having means for clamping it in any chosen coarse adjustment position to said moveable support member.

8. A paper sheet feeding table in accordance with claim **7** in which said side lay plate is shaped to define a V-section groove along its sheet engaging edge, the median plane of said groove being horizontal.

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