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Mariaux et al.

[11] **3,871,642**

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[54] **SHEET FEEDING ASSEMBLY**

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[73] Assignee: **J. Bobst & Fils S.A.**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **271/138**, 271/99, 271/167

[51] **Int. Cl.** **B65h 3/56**

[58] **Field of Search** 271/99, 132, 138, 137, 271/165, 167, 169, 125, 124, 121, 35, 104

[56] **References Cited**

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Attorney, Agent, or Firm—Hill, Gross, Simpson, Van Santen, Steadman, Chiara & Simpson

[57] **ABSTRACT**

A sheet feeding apparatus incorporates a feed table for supporting a stack of relatively stiff sheets having a curvature and a gauge member which is generally vertically movable and which is positionable above the plane of the feed table. The gauge member can be fixed in a position spaced from the plane of the feed table a distance only slightly greater than the thickness of a sheet and held in that position until the leading edge of the lower-most sheet on the stack is introduced between the feed table and the gauge member. The gauge member is then releasable to permit it to slide freely over the upper curved surface of the sheet. The gauge member is carried in a carriage which itself is tiltable relative to the plane of the feed table.

6 Claims, 5 Drawing Figures

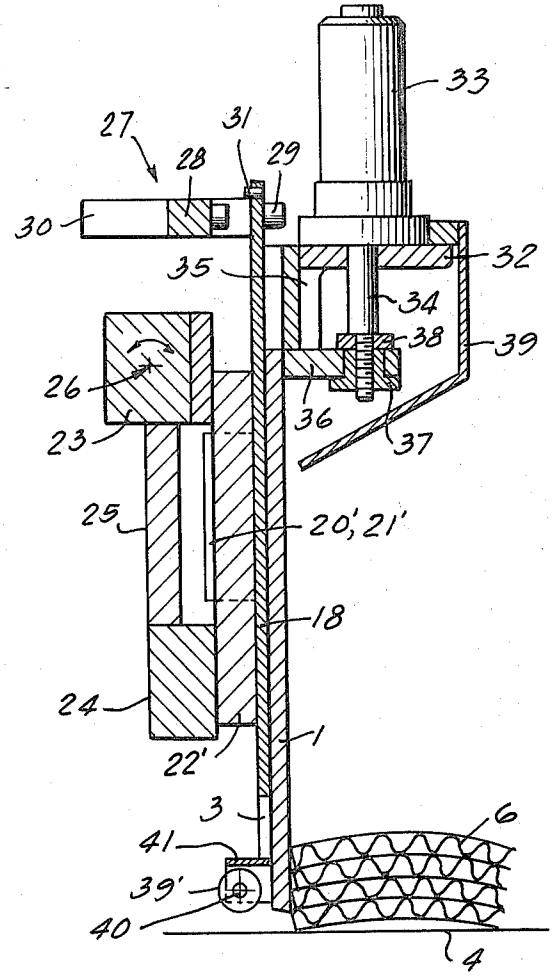
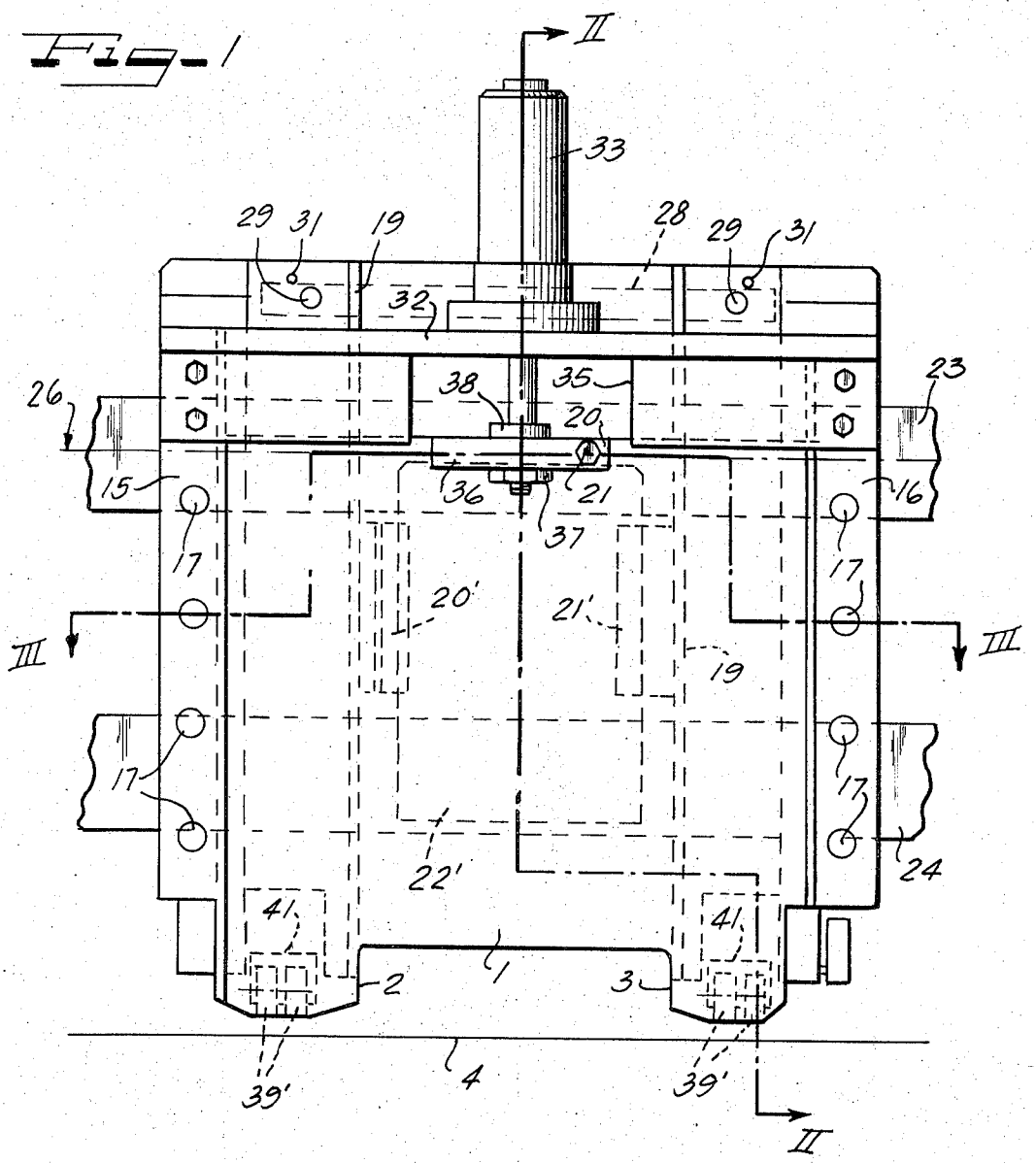


Fig. 1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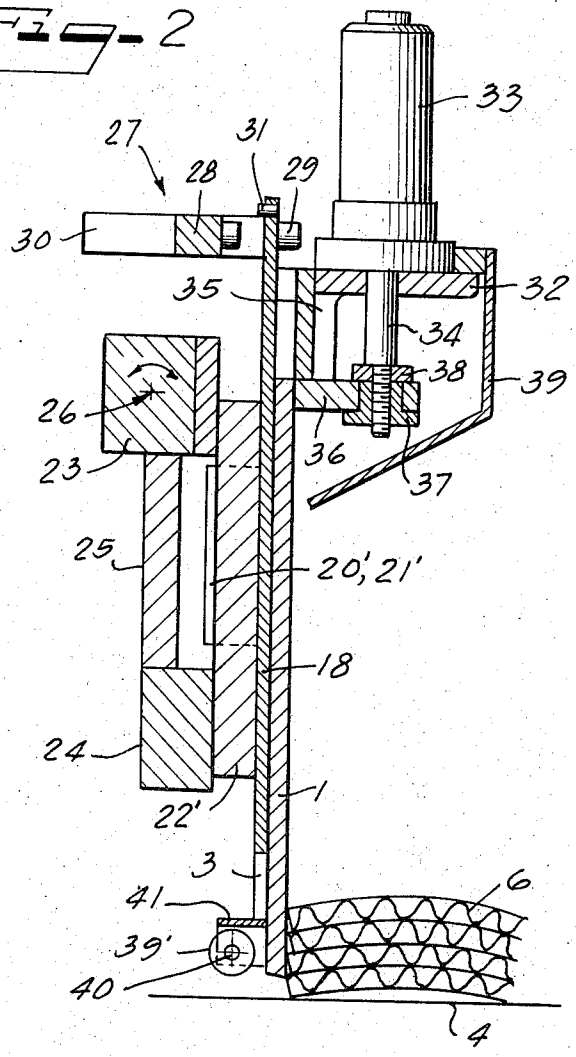
II

Fig. 2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41
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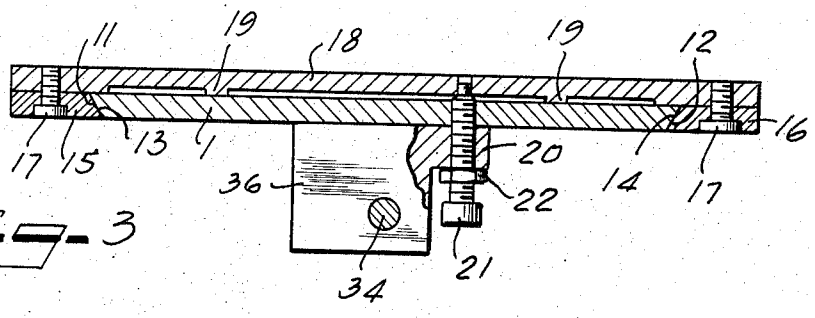
11
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18
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12
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Fig. 3

Fig-5

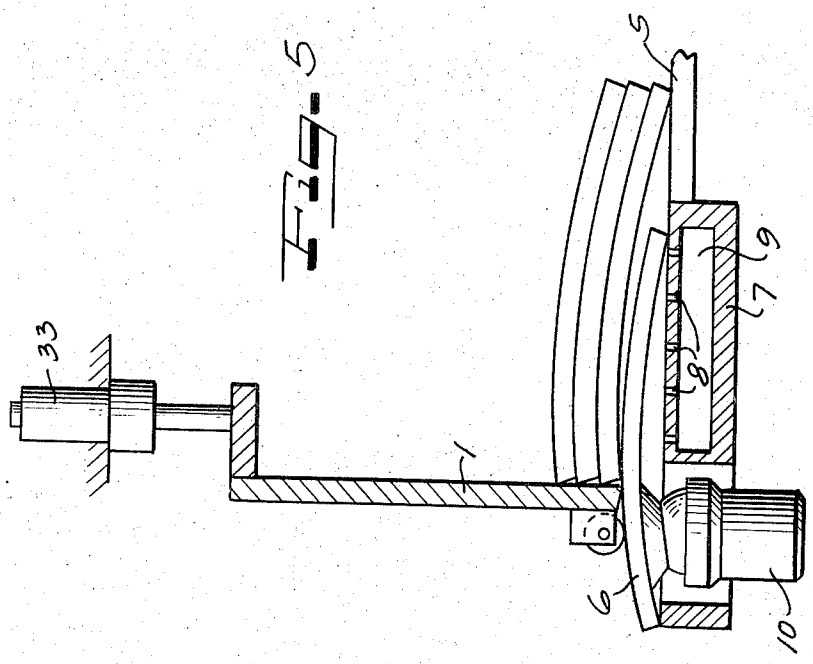
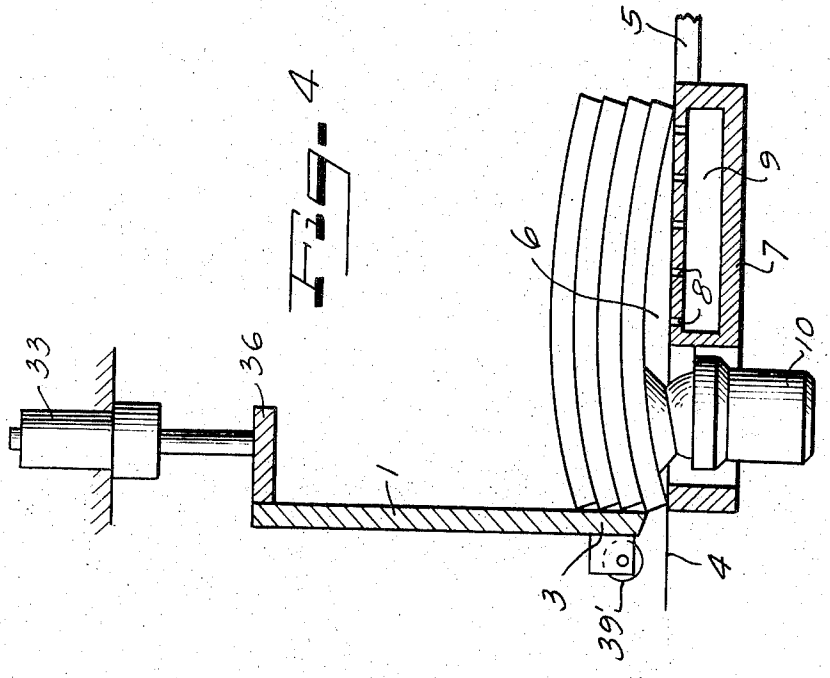


Fig-4



SHEET FEEDING ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the invention

The present invention relates to a sheet feeding apparatus for machine processing of a number of sheets from a stack of sheets wherein the sheets are generally curved and more particularly is directed to a means for permitting only one sheet at a time to pass into the feed end of the machine from the bottom of the stack of sheets.

2. Prior Art

It has been known heretofore to feed sheet stock into a sheet processing machine from a stack of sheets by stacking the sheets on a fixed table and by associating a reciprocably movable feedplate with the fixed table which feed plate is equipped with its own suction system so that by applying suction to the feed plate at the proper moment the lowermost sheet will be removed from the stack of sheets and fed into the sheet processing machine. Ordinarily, a gauge of some sort is provided which is spaced off the fixed table a distance only slightly greater than the thickness of one sheet so as to permit a single sheet to pass beneath it upon forward movement of the feed plate. At such times the other sheets butt against the gauge and remain in proper stacked relation relative to one another.

In such mechanisms as have heretofore been used in the prior art, it is extremely difficult if not impossible to feed into the machine sheets which have any appreciable degree of curvature, such sheets are, however, very often encountered in the case of machines used for the purpose of processing corrugated stock or stiff cardboard stock.

SUMMARY OF THE INVENTION

The feed mechanism constructed in accordance with the present invention is designed so that the gauge used for the purpose of permitting only a single bottom sheet from a stack of sheets to pass into the feed end of the machine is movable relative to the feed table and in fact can be displaced upwardly once the leading edge of the sheet has passed beneath it so as to ride up and over the upper curved surface of the lowermost sheet under the stack.

The gauge is fitted within a carrier and can be displaced upwardly within the carrier and has its upper end connected to a means for intermittently locking the slide in a fixed postion at the beginning of the insertion operation and releasing it thereafter so that the slide is permitted to freely travel the upper curved surface of the sheet being fed into the sheet treating mechanism.

The means for fixing the slide within the carrier and for releasing it for free movement comprises a pneumatically actuable piston which is operatively connected with the means for applying suction to the feed plate.

In addition, the carrier itself is angularly adjustable relative to the plane of the feed table.

It is therefore an object of the invention to provide a gauge means for permitting the feeding, one sheet at a time, of stiff sheet stock having an appreciable degree of curvature.

Another object of the invention resides in the provision of sheet feeding means of the type described above wherein the gauge for permitting passage of only a single sheet at a time at the beginning of the insertion operation is rendered freely movable so as to ride along the upper curved surface of a sheet being fed and wherein the gauge and the carrier member within which it slides are angularly movable relative to the plane of the feed table.

These and other objects, advantages, and features of the present invention will become apparent from time as the following specification proceeds and with reference to the accompanying drawings, wherein:

FIG. **1** is a front elevational view of the gauge member and its associated carriage overlying a feed table;

FIG. **2** is a vertical sectional view (with a few parts in side elevation) of the gauge member and carriage illustrated in FIG. **1** and showing the relationship of the lower end of the gauge member to the curved stiff sheets to be fed just prior to the beginning of an insertion;

FIG. **3** is a fragmentary horizontal sectional view taken along the lines III—III of FIG. **1** and showing the means for locking the gauge member to its respective carriage;

FIG. **4** is a diagrammatic vertical sectional view of the sheet feeding mechanism just prior to the beginning of an insertion operation;

FIG. **5** is a vertical sectional view identical to that of FIG. **4** but showing the disposition of the parts after the leading edge of the lowermost sheet of the stack of sheets has been fed beneath the gauge member.

Referring initially to FIGS. **1, 4** and **5** there is shown (schematically in FIGS. **4** and **5**) a gauge number **1** having a pair of depending legs **2** and **3** which are positionable above the plane **4** of a feed table **5** a distance only slightly greater than the thickness of a curved sheet **6** to be fed into a sheet treating mechanism.

A reciprocably movable feed plate **7** is disposed with its upper surface in co-planar relation with the upper surface of the feed table **5** and has a plurality of apertures **8** formed therein which open to a vacuum chamber **9** in order to assist a telescopic suction cup **10** to hold or fix the lowermost sheet **6** of the stack of sheets to the reciprocably movable feed plate **7** so that as the feed plate moves toward the left from the position shown in FIG. **4** toward the position shown in FIG. **5,** the lowermost sheet **6** will be carried with the feed plate.

The movable gauge comprises a substantially flat plate having elongated chamfered side edges **11** and **12** (see FIG. **3**) which are adapted to have sliding engagement with side edges **13, 14** of a pair of side frames **15,** which are bolted by means of bolts **17** to a carriage member **18.** The carriage member **18** has a flat face which has a pair of ribs **19** protruding from the inner surface thereof so as to provide sliding bearing contact with the flat face of the gauge member **1.** A lug **20** is formed integrally with the gauge member **1** and has a bolt **21** fitted therein and provided with a lock nut **22** so that the bolt can be screwed tightly into engagement with the face of the carriage **18** with the inner end of the bolt protruding into a hole formed in the carriage member so as to provide fixed locking engagement between the gauge member **1** and the carriage **18** to prevent movement of the gauge member in the carriage.

The carriage member **18** has a pair of fixtures **20′, 21′** affixed to one side thereof and supported for substantially vertical sliding movement in a slide **22′** which, in turn, is rigidly secured to a pair of struts **23,**

24. The struts **23, 24** are joined together by a member **25** and are pivotal about an axis **26** (see FIGS. **1** and **2**) so as to provide a means for tilting them with their carriage member above the plane of the feed table **5.** Dowels **31** position the carriage member and its associated gauge member.

A height adjustment device **27** is provided for predetermining the lowermost position which will be occupied by the gauge member **1** and this height adjusting device includes a cross member **28** secured to the carriage **18** by screws **29** and by a screw arrangement (not shown) engaging in a toothed groove **30** so as to permit precise positioning of the height of the carriage in relation to the cross member **28.** A locking device is provided for locking the carriage **18** in any desired pivoted position relative to the axis **26.**

The carriage **18** has a flanged support **32** connected thereto and overlying the gauge member **1** and this flanged support has a pneumatic cylinder **33** mounted thereon which, in turn, has a piston **34** which is extensible from the gauge of the cylinder to throw the gauge member to its lowermost position as shown for example in FIGS. **1, 2** and **4.** A portion of the flanged support **32** is cut away as at **35** so as to permit the outwardly extending flange **36** connected to the gauge member **1** to pass up into the cutout **35.** The outermost end of the piston **34** is secured to the flange **36** by a nut **37** so that extensible movement of the piston **34** from the cylinder gauge **33** will move the gauge member **1** to its lowermost position. A washer **38** rests against the shoulder outer end of the piston **34.** A protective cap **39** overlies the point of connection of the piston **34** and the flange **36** so as to protect this area from being interferred with by the stack of sheets on the feed table.

The side of the gauge member **1** opposite from the stack sheets is provided with a pair of rollers **39'** carried on the axis **40** which, in turn, are carried on fixtures **41** so as to permit the roller end of the gauge member to roll over the upper curved surface of a sheet passing beneath the gauge member.

As noted in FIG. **3,** a small friction surface is provided between the carriage and the gauge member so that when the pneumatic cylinder **33** releases the downward pressure against the piston **34** the gauge member **1** will be rendered freely movable within the carriage **18.**

FIGS. **4** and **5** schematically illustrate the operation of the feed mechanism. At the beginning of the inserting operation, the carriage is first adjusted vertically so as to position the lower end of the gauge member the desired distance above the plane **4** of the feed table **5** (slightly greater than the thickness of a sheet). The stack of sheets are supported both by the feed table **5** and by the feed blade **7** and are so positioned that their leading edges bear against the gauge member **1.**

When the insertion operation begins, the telescopic suction cup **11** moves into engagement with the underside of the lowermost sheet and grips that sheet and, in conjunction with the vacuum applied to the chamber **9** and communicated to the under surfaces of the lowermost sheet through the holes **8,** tightly holds the lowermost sheet in fixed relation with the feed blade **7.**

The feed blade then moves forward (to the level in FIGS. **4** and **5**) and at the moment that such movement begins, the pneumatic cylinder **33** is pressurized so as to prevent any upward movement of the gauge member **1.** Immediately after the leading edge of the lowermost sheet passes beneath the gauge member, the pneumatic cylinder is vented to render the gauge member **1** freely movable within the carriage **18.** If the curved surface of the lowermost sheet is caused to move beneath the gauge member **1** by forward movement of the sheet blade **7,** the gauge member **1** moves upwardly to accomodate the curved surface while at the same time forward movement of the remaining sheets is prevented. The gauge member **1** follows the contour of the sheet until the trailing edge of that sheet passes beneath it and at that time the cylinder **33** is again pressurized and the feed blade **7** returns to its initial starting position and the cycle repeats itself.

Actuation of the pneumatic cylinder **33** and the evacuation of the feed blade **7** are of course synchronized as for example by an electric pneumatic programming device or by an electrically controlled valve in the pneumatic cylinder circuit so that the cylinder **33** is only momentarily pressurized just at the point of introduction of the lowermost sheet between the gauge member and the plane of the feed table and so that at all other times the gauge member will be freely movable within the carriage.

We claim as our invention:

1. A sheet feeding apparatus for feeding stiff curved sheets one at a time from a vertical stack of such sheets to a line of position in a sheet processing machine comprising: a feed table having a shuttle reciprocably movable in a horizontal plane from a first retracted position to an extended position to carry sheets from said feed table to the feed line of position; an upstanding gauge member initially positionable so as to overlie the plane of said feed table and shuttle a distance greater than the thickness of one sheet to be fed and less than the thickness of two such sheets; said gauge member being located adjacent the leading end of said shuttle and in spaced relation from said line of position; means holding said gauge member in said initial position until said shuttle has carried the leading edge of a sheet beneath said gauge member and thereupon releasing said gauge member for free upward movement above the plane of said shuttle and feed table; whereby said gauge member will ride freely along the upper curved surface of the said sheet being fed to the line of position by said shuttle.

2. A sheet feeding apparatus constructed in accordance with claim **1,** wherein said gauge member is provided with a bearing establishing roller bearing contact with said curved surface of said sheets.

3. A sheet feeding apparatus constructed in accordance with claim **1,** wherein said means holding said gauge member comprises a pneumatic piston connected to said gauge member and actuable when said shuttle is in a retracted position.

4. A sheet feeding apparatus constructed in accordance with claim **1** further comprising pivot means carrying said gauge member and the associated means holding said gauge member and permitting said members to tilt relative to the plane of said shuttle and feed table.

5. A sheet feeding apparatus constructed in accordance with claim **1,** wherein said gauge member rides in a tiltable carriage and has free sliding engagement with said carriage whereby it can freely float therein and wherein said means holding said gauge member in said initial position is carried in said carriage.

6. A process for feeding sheets of material one at a time from a vertical stack of such sheets lying on a feed table to a line of position which comprises placing a gauge member above the plane of said feed table a distance greater than the thickness of one and less than the thickness of two such sheets; holding said gauge member in such position while conveying the lowermost sheet from said stack toward the said line of position and thereupon releasing said gauge member for free upward movement once the leading edge of the lowermost of said sheets passes said gauge member whereby the gauge member can then ride freely over the curved upper surface of said lowermost sheet.

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