May 13, 1952 T. TORONTO 2,596,448

APPARATUS FOR STACKING SHEET MATERIAL

Filed March 5, 1946 2 SHEETS--SHEET 1

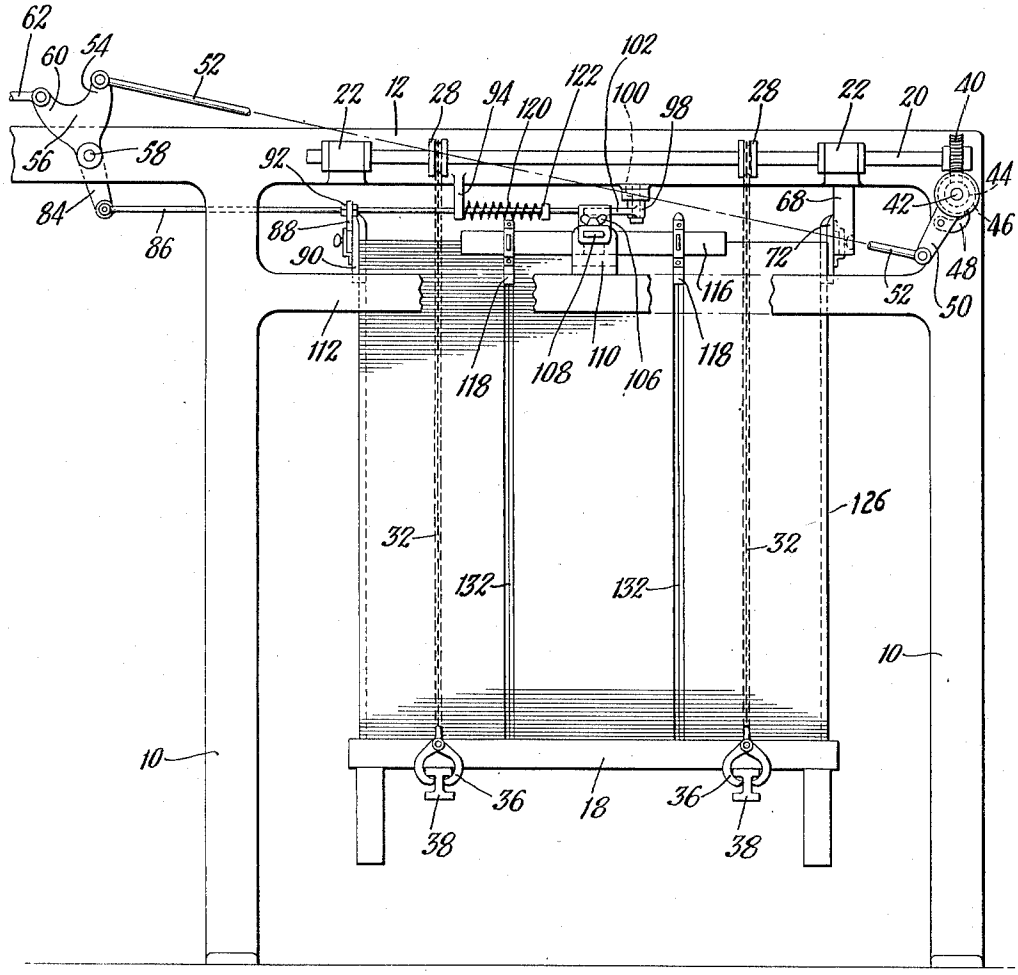


Fig. 1.

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APPARATUS FOR STACKING SHEET MATERIAL

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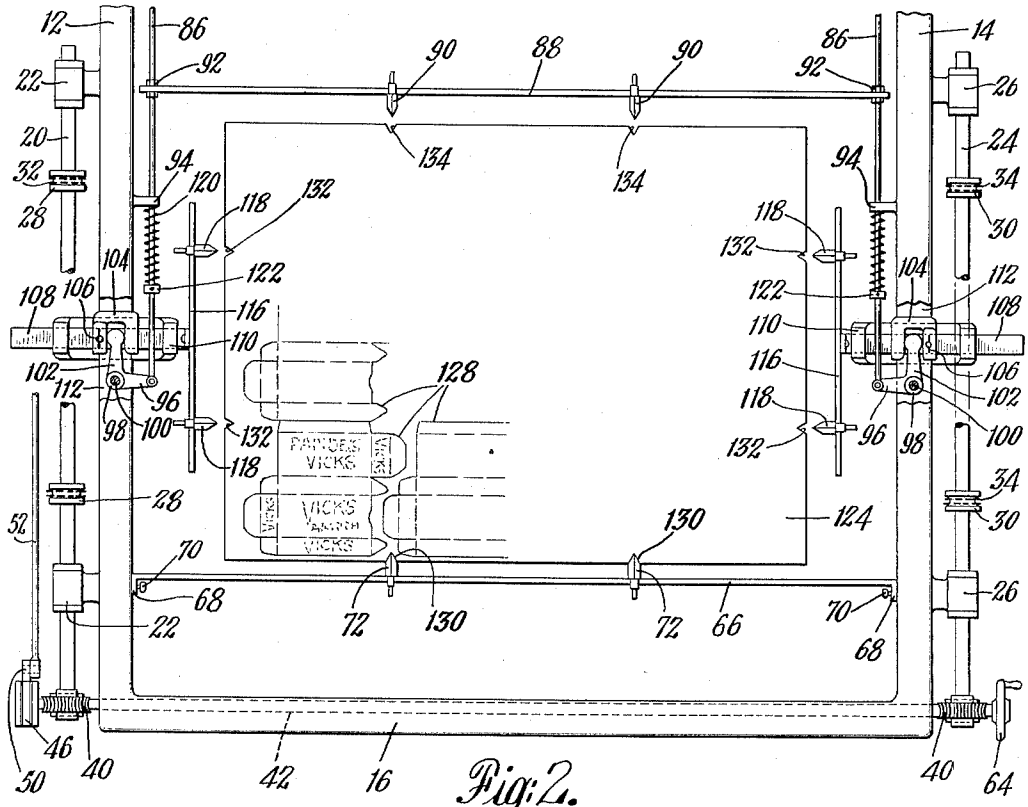


Fig. 2.

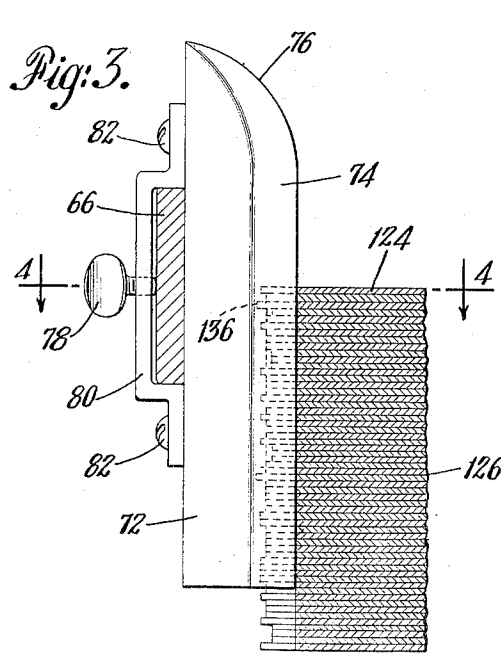


Fig. 3.

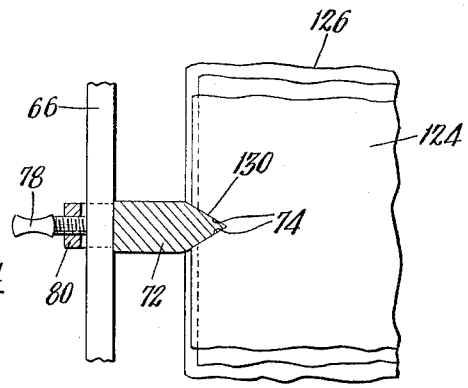


Fig. 4.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR STACKING SHEET MATERIAL

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2 Claims. (Cl. 271—89)

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The present invention relates to apparatus for facilitating accurate stacking of sheets of paperboard and the like as they are ejected from a cutting and creasing press. More particularly, it relates to the accurate stacking of such paperboard sheets in a manner to assure that the cuts and creases therein shall be in accurate vertical alignment irrespective of such irregularities as may exist in the edges of the sheets.

In the manufacture of many forms of paperboard boxes, appropriate cutting and scoring is formed in flat sheets of rectangular outline. There may be a single blank in each sheet as in the case of large boxes, or there may be a plurality of blanks for small boxes. In any event, they are laid out in such a manner as to secure maximum efficiency with regard to the use of paperboard. The individual blanks are not cut entirely free of the sheet, and standard practice in this respect is to form appropriately spaced nicks in the cutting blades of the creasing and cutting press whereby to leave very small bridges of paperboard extending across the cuts.

Usually the blanks formed in a sheet are so arranged as to leave a narrow margin of waste material extending continuously around the sheet. It will be appreciated that other waste sections lie between the various parts of the blank or blanks and that all of this waste material must be removed prior to completion of the boxes. To this end a large number of sheets is usually stacked upon a skid and an operator separates the waste from the box blanks by an operation called stripping.

Until recently the stripping operation was performed by the use of hand hammers of appropriate shape. This hand stripping operation is now being supplanted in many instances by air hammer stripping wherein use is made of vibratory hammers equipped with chisel-like bits. In such operation the bit is inserted into a cut in the uppermost sheet within the stack and the hammer is then operated to strip the waste from the blanks in the successive sheets downwardly of the stack.

In order to secure the full advantage of air hammer stripping it is desirable to operate on stacks of sheets of the maximum height to which the air hammer may be conveniently lifted. In practice the height of the stacks is approximately forty inches and such height is well within the capacity of the stacking mechanism usually associated with a cutting and creasing press. However, it has been found that

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the ordinary stacking mechanism, which operates with sufficient accuracy for hand hammer stripping, is incapable of stacking the sheets with sufficient accuracy for air hammer stripping. Accordingly it has been necessary to employ operators either to true up the edges of the stack as it builds up at the press, or to restack the sheets prior to stripping.

It will be apparent that in air hammer stripping accurate alignment of the blanks in the sheets is of critical importance. Substantially every blank which happens to be even slightly out of position will be ruined. The hand stacking operations described above are only partially effective inasmuch as it is only the outside or waste edges of the sheets which may be aligned. The cuts defining the box blanks do not necessarily bear a fixed relationship to the outside edges of the sheets and the waste margins are thus irregular in width. This is because the sheets are first blanked out and fed manually or automatically to the press and there is nothing short of incurring prohibitive costs to assure accuracy in any of these operations. For this same reason the edge joggers frequency employed in printing presses and envelope machines, for example, would be of little value in the solution of the present problem.

It is an object of the present invention to provide alignment means integral with a paperboard sheet having a readily severable blank or blanks cut therein, the position of said alignment means being accurately related to the position of the cuts defining the blank or blanks in said sheet.

It is a further object of the present invention to provide a paperboard sheet having a readily severable blank or blanks cut therein and alignment notches cut therein in accurate positional relationship to said blank or blanks.

It is a further object of the present invention to provide automatic aligning mechanism for cooperation with sheet material having alignment notches cut therein.

It is a further object of the present invention to provide automatic jogging mechanism for association with the stacking devices of a cutting and creasing press to jog paperboard sheets discharged from said press into accurate vertical alignment with respect to the cuts therein and irrespective of the outer edges thereof.

Other and further objects will become apparent upon a consideration of the following detailed description of a preferred embodiment of the invention, taken in connection with the

drawings accompanying and forming a part of this specification.

In the drawings:

Fig. 1 is a side elevation of apparatus embodying the invention;

Fig. 2 is a top plan view of the same;

Fig. 3 is a fragmentary detail view of one of the jogger heads showing its operative relationship with a stack of notched sheets; and

Fig. 4 is a fragmentary section taken along the line 4—4 in Fig. 3.

Referring now to the drawings, there is shown a stacking device with which is associated the jogging mechanism of the present invention. Many features of the stacking device are conventional in the art, and it will be understood that for purposes of illustration, only one of the various types of stacking mechanism has been selected for illustration of my invention. Obviously, the invention may be adapted to any conventional form of stacking device.

The stacking device includes a main framework having legs 10 joined by side rails 12 and 14 and a rear rail 16. The side rails 12 and 14 are broken away in Figs. 1 and 2, but it will be understood that these rails extend forward into engagement with the framework of a cutting and creasing press (not shown). Any conventional cutting and creasing press may be used. It is preferred to take the power for operation of certain movable parts in the stacking device and in the jogging device of my invention from suitable points in the cutting and creasing press. Other than this, and the fact that the stacking device must of course be so positioned with regard to the discharge end of the cutting and creasing press as to receive the paperboard sheets therefrom, the device of my invention is in on way dependent upon the particular design of the cutting and creasing press.

The stacking device is arranged to support a conventional skid 18 in position to receive the cut and creased sheets. The skid is supported in such manner that at the beginning of operation it is carried at a relatively high level and as stacking proceeds, the skid is progressively lowered at such a rate as to maintain substantially a uniform level at the top of the stack. Any suitable mechanism may be employed for this purpose and in the stacking device herein illustrated, this mechanism comprises a shaft 20 carried in suitable bearings 22 on the side rail 12 and a similar shaft 24 carried in bearings 26 on the side rail 14. The shafts 20 and 24 are provided with winding drums 28 and 30, respectively, which receive chains 32 and 34, respectively. At their lower ends the chains 32 and 34 carry releasable hooks 36, the hooks on the chains 32 being shown in Fig. 1. The hooks 36 engage opposite ends of I-beams 38 which extend beneath the skid 18.

The shafts 20 and 24 carry at their rearward ends worm-wheels 40 which engage with worm-gears secured near each of the ends of a cross shaft 42 extending beneath the rear rail 16. The worm gear 44 which engages the worm wheel 40 on the shaft 20 is shown in dotted lines in Fig. 1. It will be understood that the worm gears 44 and worm wheels 40 are so arranged as to provide for rotation of the shafts 20 and 24 at the same angular speed and in opposite angular directions.

At its left-hand end beyond the worm gear 44 the shaft 42 has secured thereto a ratchet wheel 46 which is engaged by a pawl 48 carried on a lever 50 freely pivoted upon the shaft 42. A link 52 connects the outer end of the pawl lever 50 to an arm 54 of a bell crank 56 secured to a rock shaft 58 extending across the machine and pivoted in the rails 12 and 14. Another arm 60 of the bell crank 56 has connected to it a link 62 which is connected to a suitable oscillating or rotating part in the cutting and creasing press.

Preferably, the link 62 is connected to a part in the cutting and creasing press which oscillates or rotates once for each operation of the press. The bell crank 56 thus will rock once for each operation of the press, and the pawl 48 will impart a suitable increment of rotation to the shafts 42, 20 and 24. The parts are so proportioned that each incremental rotation of these shafts will result in a lowering of the skid 18 through a distance substantially equal to the thickness of the sheet of paperboard ejected from the cutting and creasing press upon each operation thereof.

At the righthand end as seen in Fig. 2, the shaft 42 carries a hand wheel 64 which may be operated to bring the empty skid up to proper level for the beginning of operation and which may be operated to make such adjustments in level as may be necessary during the stacking operation.

All of the mechanism thus far described is conventional in nature and, except for its cooperation therewith, forms no part of my invention.

The jogging mechanism of the present invention generally comprises wedge-shaped jogging heads at least some of which reciprocate into and out of seating relationship with V-shaped notches cut in opposed margins of the paperboard sheets. These heads may be so arranged as to enter and leave the notches at any frequency desired, and to operate simultaneously and repeatedly upon the several paperboard sheets uppermost upon the stack at any given time. This operation will place the apices of the notches in successive sheets in exact registry. Thus, provided that the notches bear exact positional relationship to the blank or blanks in the sheets, the blanks will be similarly registered.

In the embodiment shown in the drawings, a cross bar 66 having brackets 68 at opposite ends thereof is adjustably secured by means of set-screws 70 to the side rails 12 and 14. The cross-bar 66 carries a pair of jogging heads 72. The heads 72 and the manner in which they are secured to the cross-bar 66 are illustrated in detail in Figs. 3 and 4. These heads 72 may be identical in these respects to the remaining heads in the device, and a detailed description will be made only in connection with the heads 72.

As shown in Fig. 3, the jogging head 72 comprises an elongated body made of metal or other suitable material having converging faces 74 disposed at such an angle to each other as to define a wedge having a vertically disposed knife-like edge as shown in cross section in Fig. 4. At its upper end the head 72 may be flared outwardly as indicated at 76 for the purpose of facilitating entry of the paperboard sheets between the various heads provided in the device. The head 72 is secured to the cross-bar 66 by means of a set-screw 78 threadedly received in a strap 80 which is in turn secured to the head 72 as by screws or rivets 82.

The construction just described provides for adjustment of the heads 72 both cross-wise and fore and aft of the stacking device. The heads 72 are fixed in adjusted position in the embodi-

ment of the invention chosen for illustration although it will be understood as description of the device proceeds that the heads 72 may be mounted for reciprocation if so desired. In the present embodiment reciprocable jogging heads are provided for the three remaining edges of the paperboard sheets.

The cross shaft 58, shown only in Fig. 1, has secured for rotation therewith a pair of downwardly extending arms 84, one of which is shown in Fig. 1. The arms 84 are located respectively adjacent the side rails 12 and 14 and are pivotally connected at their lower ends to a pair of links 86 located on opposite sides of the machine.

Referring now to Fig. 2, it will be observed that the links 86 are joined to one another by a cross-bar 88 similar in cross-section to the bar 66 shown in Fig. 3. The cross-bar 88 carries a pair of jogging heads 90 which are adjustable therealong and are preferably identical to the jogging heads 72. At its opposite ends the cross-bar 88 is adjustably secured to the links 86 in order that it may be moved relatively thereto in a direction fore and aft of the machine. For this purpose suitable releasable gripping devices 92 are provided for connecting the ends of the cross-bar 88 to the links 86.

The links 86 extend through suitable sliding bearings 94 carried respectively by the side rails 12 and 14 and are pivotally connected at their ends to inwardly directed arms 96 of a pair of oppositely disposed bell cranks 98. The bell cranks 98 are located respectively beneath the side rails 12 and 14 and are pivoted on suitable studs 100 depending therefrom (see Fig. 1).

The arms 102 of the bell cranks 98 may have rounded end portions which are received in yoke-blocks 104 adjustably secured as by set screws 106 to an oppositely disposed pair of slides 108. The slides 108 are mounted for movement in brackets 110 carried by lower rails 112 and 112 extending respectively generally parallel to and beneath the side rails 12 and 14 (see Fig. 1). At its inner end each of the slides 108 carries a bar 116 similar in cross-section to the bar 66 in Fig. 3 and each of the bars 116 in turn has adjustably mounted on it a pair of jogging heads 118 which may be identical to the jogging heads 72 described above.

Springs 120 may be provided on the links 86 if the particular driving mechanism used should require. The springs 120 are located between the bearings 94 and suitable collars 122 fixed to the links 86. The springs 120 may be expansive or contractile as required, or may be omitted entirely in the event the particular driving mechanism is positive in both directions.

As stated above, the mechanism just described is designed to operate upon sheet material having locating notches so shaped as to conform to the working faces of the jogging heads 72, 90 and 118. To this end the head of the cutting and creasing press is provided with suitable knives for cutting one or more notches in opposed edges of the sheets simultaneously with the cutting and creasing of the blank or blanks therein. The mechanism shown in the drawings is preferred when the sheets are large and relatively limber as in the case of chipboard sheets having a large number of small box blanks cut therein. In such cases the provision of a plurality of jogging heads for cooperation with all four edges of the sheets is advisable. When relatively stiffer and/or smaller sheets are involved, it may be considered advisable to use only one jogging head for each edge of the sheet or to use one or more jogging heads for only two opposed edges of the sheet.

In Fig. 2 there is shown the uppermost sheet 124 of a stack 126 of such sheets shown in side elevation in Fig. 1. The sheet 124 has cut and scored into it a number of box-blank 128 and it will be understood that all of the sheets in the stack 126 have identical blanks therein. In order to assure that the blanks 128 will be brought into exact registry throughout the stack 126, each of the sheets has two V-shaped notches cut in each of the edges thereof. The sheet 124 is therefore provided with notches 130 in the rear edge for cooperation with the jogging heads 72, notches 132 in the side edges for cooperation with jogging heads 118 and notches 134 in the forward edge for cooperation with the jogging heads 90. The notches 130, 132 and 134 are cut in the sheet 124 simultaneously with the cutting and creasing of the blanks 128 and it will be observed that the particular locations of the notches are selected with due regard to the layout of the blanks. In this connection it should be pointed out that the notches need not be arranged in precise symmetry, a generally symmetrical arrangement being all that is necessary. When a suitable blank layout and notch arrangement has been decided upon, the jogging heads 72, 90 and 118 are set in proper position by adjustments as described above.

The jogging heads 72 are set in such position that the notches 130 will fall approximately into registry therewith when the sheet 124 is delivered from the cutting and creasing press, the flared upper ends of the jogging heads being useful in this connection. The remaining jogging heads 90 and 118 are set in such position that when they are projected to their innermost positions they as well as the jogging heads 72 will seat firmly in the corresponding notches.

When the cutting and creasing press is put into operation the connections described above, including the bell crank 56, will be effective to impart reciprocatory motion to the links 86 as indicated by the arrows in Fig. 2. This motion will be imparted directly to the jogging heads 90 and through the bell cranks 98 to the jogging heads 118. The frequency of reciprocation is a matter of choice but it is preferable that the movable jogging heads 90 and 118 should be at least partially retracted as illustrated in Fig. 2 at the time a sheet 124 is delivered from the cutting and creasing press to the stacking device. Entirely satisfactory operation is experienced if the movable jogging heads are reciprocated once for each delivery of a sheet 124.

In Figs. 3 and 4, a jogging head 72 is shown in seated relationship with the notches 130 in the several upper sheets in the stack 126. It will be observed that the apices of the V-shaped notches 130 are in very accurate vertical alignment irrespective of misalignment of the edges which may exist as illustrated in exaggerated form in Fig. 3 at 136. Repeated operation of the movable jogging heads 80 and 118 serves to jog these uppermost sheets into such positions and by the time a given sheet has been lowered below the extended faces of the jogging heads it will have sufficient pressure exerted upon it by the sheets thereabove to be substantially secure against further lateral movement.

A partially complete stack 126 of properly registered sheets is shown in Fig. 1 wherein the vertically aligned notches 132 may be observed.

When the stack 126 is built up to desired height the skid 18 is lowered and conveyed to a suitable place for stripping of the stack. The stripping operation is greatly facilitated and damage to blanks is almost entirely eliminated as a result of the accurate registry of the blanks themselves which is provided in accordance with the present invention.

The term "notches" and variations thereof, as used herein and in the appended claims, is intended to include openings extending into or through sheet material, without regard to configuration, and may be V-shaped, rectangular, arcuate or otherwise, as desired.

Modifications and variations in detail may occur to those skilled in the art, and since the present disclosure is illustrative rather than limiting, it is intended that the invention shall include such modifications and variations as fall within the proper scope of the following claims.

I claim:

1. In apparatus for handling successively presented sheets of paperboard having one or more box blanks cut and scored therein and having a plurality of V-shaped notches cut out of opposed edges of said sheets in accurate and uniform positional relationship with said box blanks, means for stacking said sheets with corresponding box blanks in successive sheets in substantially exact register, said means comprising a plurality of vertically elongated jogging members, the working portions of said jogging members comprising converging walls and being V-shaped in cross section to substantially conform to the shape of the notches cut in said sheets, and means for moving at least some of said jogging members relative to others of said jogging members and into and out of the notches in said sheets substantially in rectilinear paths normal to the edges of said sheets and bisecting the angle between the converging walls of the working portions of said jogging members to move the successively presented sheets, if necessary, into accurate vertical registry with respect to the notches and box blanks therein.

2. In apparatus for handling successively presented sheets of paperboard having one or more box blanks cut and scored therein and having a plurality of convergent-walled notches cut out of opposed edges of said sheets in accurate and uniform positional relationship with said box blanks, means for stacking said sheets with corresponding box blanks in successive sheets in substantially exact register, said means comprising a plurality of vertically elongated jogging members, the working portions of said jogging members comprising converging walls and being so shaped in cross section as substantially to conform to the shape of the notches cut in said sheets, and means for moving at least some of said jogging members relative to others of said jogging members and into and out of the notches in said sheets substantially in rectilinear paths normal to the edges of said sheets to move the successively presented sheets, if necessary, into accurate vertical registry with respect to the notches and box blanks therein.

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