

[54] **PERFORATOR FOR PERFORATING A STACK OF PAPER SHEETS**

[75] Inventors: **Katsumi Otsuka**, Funabashi; **Kosaku Yoshizawa**, Chiba; **Miyagi Tamura**, Togane; **Koji Kondo**, Chiba; **Hideo Tsukamoto**, Tokyo, all of Japan

[73] Assignee: **New Kon Industrial Co., Ltd.**, Tokyo, Japan

[22] Filed: **May 31, 1974**

[21] Appl. No.: **475,332**

[30] **Foreign Application Priority Data**

June 27, 1973 Japan..... 48-76365

[52] U.S. Cl. **83/467; 83/620; 83/626; 83/632; 83/633**

[51] Int. Cl.² **B26D 5/14; B26D 7/16; B26F 1/14**

[58] Field of Search **83/25, 140, 468, 467, 522, 83/559, 618, 633, 634, 620, 625, 626, 632**

[56] **References Cited**

UNITED STATES PATENTS

2,524,582	10/1950	Yerkes.....	83/633 X
3,176,570	4/1965	Gaya.....	83/633 X
3,682,033	8/1972	Lanahan	83/559 X
3,714,857	2/1973	Stuertz et al.....	83/468
3,735,655	5/1973	Dedona et al.	83/140

Primary Examiner—J. M. Meister
Assistant Examiner—Fred A. Silverberg
Attorney, Agent, or Firm—Frank J. Jordan

[57] **ABSTRACT**

A perforator for perforating a stack of paper sheets comprises an inclined perforated plate having a plurality of holes therein and a recess formed in the inner surface of the perforated plate extending down from the upper edge and terminating short of the lower edge of the plate to provide a stop for the stack of paper sheets. An inclined perforated punching rod guide member is positioned opposite and parallel to the inner surface of the perforated plate to define an inclined paper stack receiving opening in cooperation with the recess. The punching rod guide member has a plurality of holes in alignment with the holes in the perforated plate, and a plurality of punching rods are reciprocally received in the holes in the rod guide member for advancing into and retracting relative to the holes in the perforated plate. A punching rod actuation member is connected to the rear ends of the rods for advancing and retracting the punching rods simultaneously into and from the holes in the plate, and a handle is operatively connected to the punching rod actuation member through an interlocking mechanism for actuating the rod actuation member.

9 Claims, 4 Drawing Figures

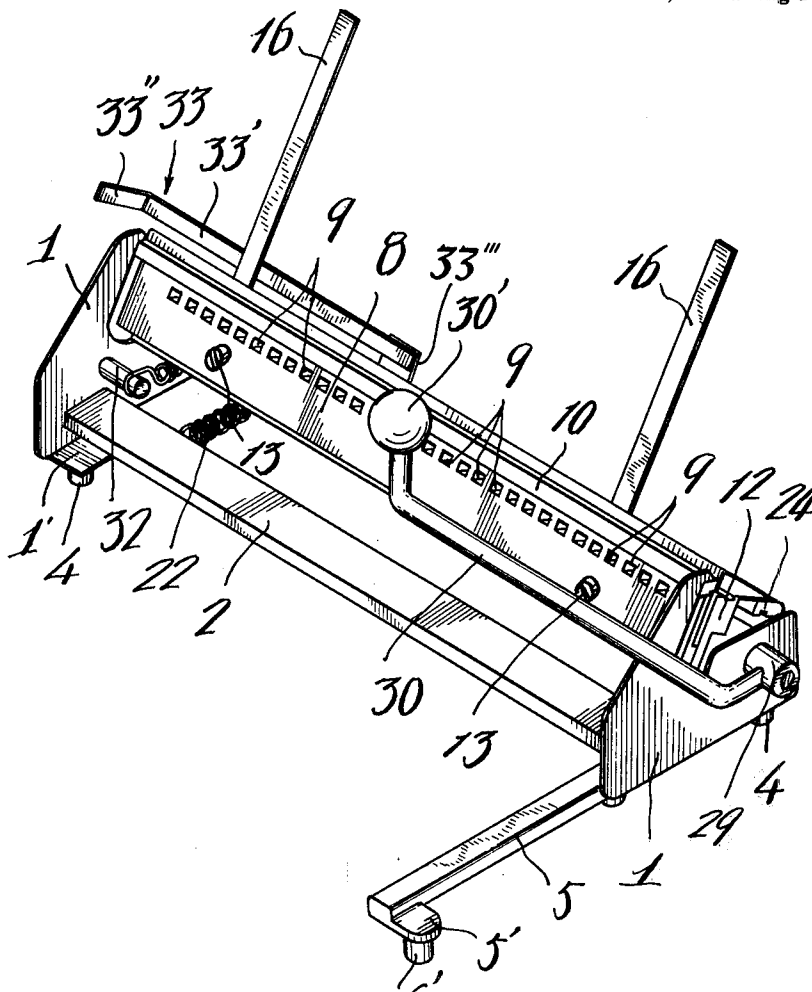
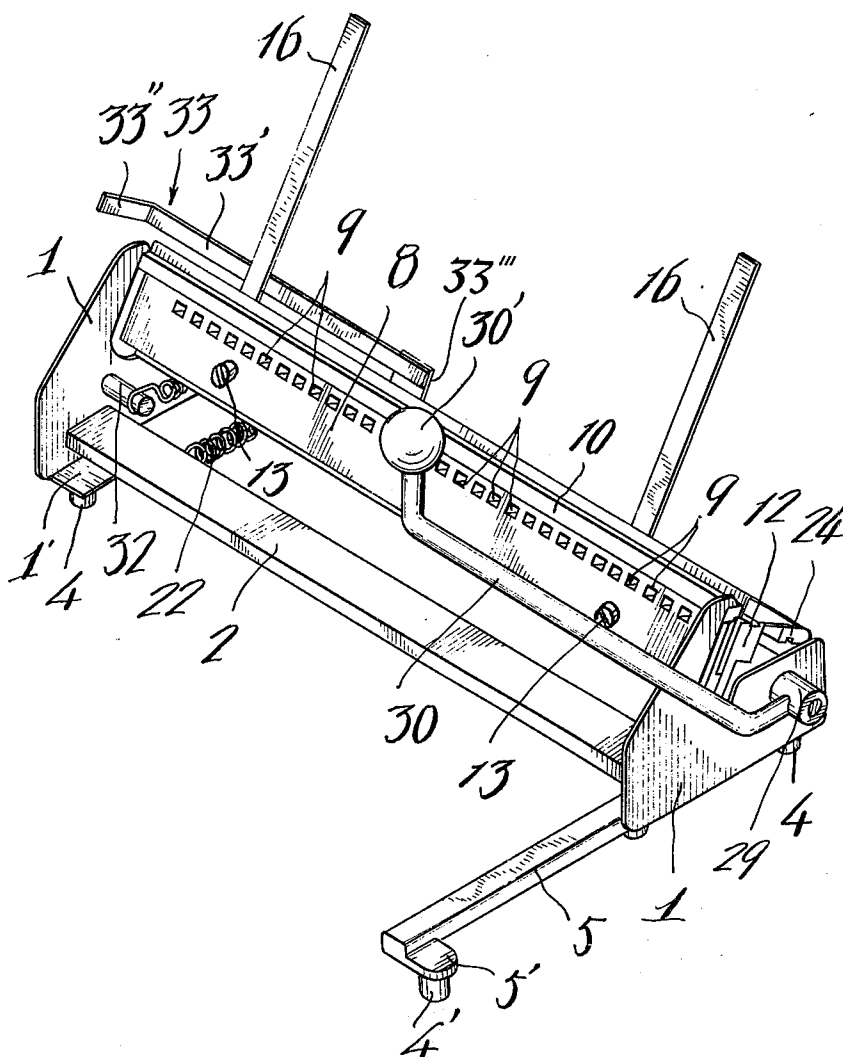
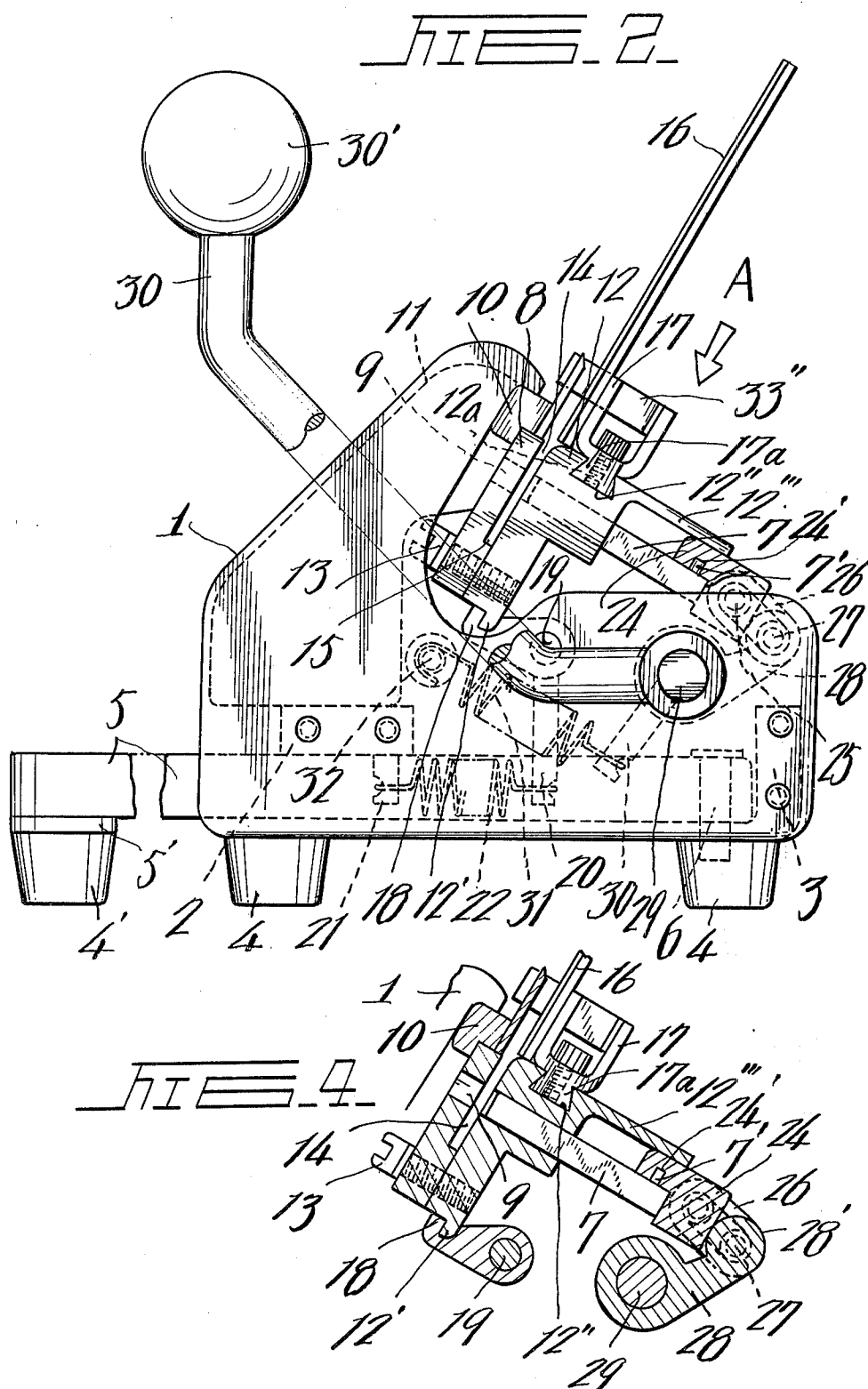


FIG. 1





PERFORATOR FOR PERFORATING A STACK OF PAPER SHEETS

BACKGROUND OF THE INVENTION

This invention relates to a perforator for perforating a stack of paper sheets and more particularly, to a perforator which does not require any time consuming paper aligning operation as a preparation step in the perforating operation and which is compact in construction.

There have been proposed and employed a great variety of perforators for perforating a stack of paper sheets such as loose leaves. However, the prior art perforators are designed to horizontally receive a stack of loose leaf paper sheets to be perforated in which the paper sheets are inserted into the perforation zone below the punching rods until the leading edges of the paper sheets abut against a stop in the perforation zone and the other edges of the paper sheets are then manually aligned, thereby involving a time consuming procedure. After the paper sheets have been properly aligned, the spring-loaded handle is pushed down to move the punching rods downwardly to cause the punching rods to punch or perforate the aligned paper sheets adjacent to the leading edges of the sheets to thereby make aligned holes in the paper sheets.

SUMMARY OF THE INVENTION

This invention improves on the above-type prior art perforators by providing a paper sheet stack receiving opening which is disposed at an acute angle with respect to the vertical so as to receive the paper sheet stack in an inclined angle with respect to the vertical to thereby eliminate the time consuming paper sheet aligning procedure as necessary in the prior art perforators which require manual alignment of the edges of the paper stack after the stack has been received in the perforators. According to the present invention, the lower edges of the paper sheets in a stack are automatically aligned when the edges lie on a stop at the bottom of the inclined paper stack receiving opening as the stack is inserted into the opening to thereby simultaneously align the upper edges of the paper sheets. The remaining edges of the paper sheets in the stack in the opening are aligned by a simple aligning operation in which one side edge of the stack is merely caused to abut against an adjustable aligning ruler positioned adjacent to the paper stack receiving opening. Furthermore, according to the present invention, the entire perforation mechanism is supported at support points which comprise two parallel and spaced side plates having support feet and a pivotal support bar having a support foot. The pivotal support bar is movable between an operating position in which the support bar extends forwardly out of the region defined by the side plates and a stowed or inoperative position in which the support bar is stowed within the above-mentioned region whereby the perforator of the invention, when not in use, occupies a smaller space or area than the corresponding size prior art perforators.

According to the present invention, there is provided a perforator for perforating loose leaf paper sheets which essentially comprises an inclined perforated plate having a plurality of spaced holes therein and a recess in the inner surface extending downwardly from the upper edge and terminating short of the lower edge of the plate to provide a stop for the paper sheet stack.

An inclined perforated punching rod guide member is positioned opposite and parallel to the inner surface of the perforated plate to define an inclined paper sheet stack receiving opening in cooperation with the recess and having a plurality of holes in alignment with the holes in the perforated plate. A plurality of movable punching rods are reciprocally received in the holes in the punching rod guide member for advancing into and retracting relative to the holes in the perforated plate. A punching rod actuation member connected is to the rear end portions of the punching rods, for advancing and retracting the rods and a handle is operatively connected to the punching rod actuation member through an interlocking mechanism for actuating the rod actuation member.

The above and other objects and attendant advantages of the present invention will be more readily apparent to those skilled in the art from a reading of the following detailed description in conjunction with the accompanying drawings which show one preferred embodiment of the invention for illustration purpose only, but not for limiting the scope of the same in any way.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of one preferred embodiment of a perforator constructed in accordance with the present invention with the transparent front cover or scrap piece receiver removed therefrom;

FIG. 2 is a side elevational view on an enlarged scale of the perforator;

FIG. 3 is a top view of the perforator looking in the direction of arrow A in FIG. 1; and

FIG. 4 is a fragmentary cross-sectional view of a portion of the perforator.

PREFERRED EMBODIMENT OF THE INVENTION

The present invention will be now described referring to the accompanying drawings which show one preferred embodiment of perforator of the invention for illustration purpose only. The perforator of the invention generally comprises a pair of parallel and spaced side plates 1 and 1 each having an L-shaped cross section. A front reinforcing bar 2 extends between the side plates adjacent to the front edges of the side plates in a slightly spaced position above the horizontal portions or feet 1' and 1' of the side plates 1 and 1 with the opposite ends of the bar 2 secured to the side plates by means of set screws and a rear reinforcing bar 3 of L-shaped cross section extending between the side plates 1 and 1 adjacent to the rear edges of the plates. The vertical leg of the L-shaped cross section rear reinforcing bar 3 is secured at its opposite ends to the side plates 1 and 1 by means of set screws. The bottom of the horizontal portion or foot of the rear reinforcing bar 3 is flush with the lower edges of the side plates. Rubber support feet 4 are secured to and project downwardly from the horizontal feet of the side plates 1 and 1 at locations adjacent to the front and rear edges of the side plates, respectively.

A pivotal support bar 5 extends horizontally below the front reinforcing bar 2 in the vicinity of one of the side plates 1 (the right-hand side plate as seen in FIG. 1) and is pivoted at the rear end to the foot of the L-shaped cross section rear reinforcing bar 3 by means of a pin 6. The pivotal support bar 5 has a lateral projection 5' and a rubber foot 4' is secured to and projects downwardly from the lateral projection 5'. Thus, when the perforator is in its non-operative position, the piv-

3

total support bar 5 is in its stowed position in which the support bar lies parallel to the front and rear reinforcing bars 2 and 3 and when the perforator is operated for its intended function, the support bar 5 is pivoted from the stowed position to the operation position shown in FIG. 1 in which the support bar extends forwardly beyond the front edge of the right-hand side plate 1 at right angles to the front and rear reinforcing bars 2 and 3 to thereby provide a multiple-point support to the perforator.

A perforated plate 8 extends between the side plates 1 and 1 above and between the front and rear reinforcing bars 2 and 3 at an acute angle with respect to the vertical and has a plurality of spaced holes 9. A holding-down bar 10 extends between the side plates 1 and 1 and is secured to the front surface of the perforated plate 8 along the upper edge of the perforated plate for the purpose to be described hereinafter. The holding-down bar 10 extends upwardly beyond the upper edge of the perforated plate 8. A transparent cover or scrap receiver 11 is removably fitted on the holding-down bar 10 for receiving scrap pieces which will be generated during the perforating operation of the perforator. A perforated punching rod guide member 12 is disposed parallel to the plate 8 and is secured to the inner surface of the perforated plate 8 by means of set screws 13. Holes provided in the guide member 12 are in alignment with the holes 9 in the perforated plate 8 and are adapted to receive a plurality of spaced punching rods 7, respectively, which are received in the holes in the rod guide member 12 to advance into and retract from the respectively associated holes 9 in the perforated plate 8 in the manner as will be described hereinafter.

As shown in FIG. 2, a projection 12' extends down from the lower edge of the punching rod guide member 12 and an upholding member 18 is provided just below the punching rod guide member 12 in engagement with the projection 12' on the guide member 12. The upholding member 18 has a shaft 19 extending laterally there through and suitably journaled at the opposite ends in the side plates 1 and 1. The upholding member 18 is secured to the shaft 19 so that the upholding member 18 and the shaft 19 always rotate together. A downwardly extending spring anchoring portion 20 is also secured to shaft 19 so that the spring anchoring portion 20 and the shaft 19 also rotate together. A cooperating spring anchoring projection 21 extends downwardly from the bottom of the front reinforcing bar 2 and a strong coil spring 22 is anchored at its opposite ends to the cooperating anchoring portion 20 and anchoring projection 21 so that the strong coil spring 22 biases the spring anchoring portion 20 and the shaft 19 to which the spring anchoring portion 20 is secured in a clockwise direction as viewed in FIGS. 2 and 4. Therefore, since the upholding member 18 is also secured to the shaft 19, the latter is also biased in a clockwise direction as viewed in FIGS. 2 and 4. Accordingly, the upholding member 18 urges the assembly consisting of the perforated plate 8 and punching rod guide member 12 towards the holding-down bar 10 so that the holding-down bar 10 and upholding member 18 pinch or clamp the perforated plate and punching rod guide member assembly 8 and 12 therebetween.

The inner surface of the perforated plate 8 is provided with a recess which extends downwardly from its upper edge to a point short of the lower edge of the plate 8 to thereby provide a paper stack receiving opening 14 in cooperation with the outer surface of the

4

perforated punching rod guide member 12. A shoulder 15 serves as a stop for limiting the downward movement of the paper sheet stack when the stack is inserted into the opening as will be described hereinafter. A pair of adjustable loose leaf paper sheet stack guide pieces 16 and 16 extend upwardly from the top of the perforated punching rod guide member 12 and have their lower ends secured to a pair of adjustable holders 17 and 17 which have dovetail-shaped lower extensions 17a. The extensions 17a are in turn adjustably received in a longitudinal dovetail groove 12'' provided in the top of the punching rod guide member 12 for adjustable slidable movement in the groove 12'' toward and away from each other to thereby provide for varying the space between the pair of paper sheet stack guide pieces 16 and 16 depending upon the size of the loose leaf paper sheets in a stack to be perforated. The guide pieces 16 extend substantially at the same angle as the stack receiving opening 14 with the outer surface thereof flush with that of the rod guide member 12. Once the guide pieces 16 and 16 have been moved to a proper position for perforating paper sheets of a particular size, the holders 17 and 17 are firmly held in position in the dovetail groove 12' by means of set screws 12a.

The punching rods 7 are provided at their rear end portions with upwardly extending projections 7' which are fitted in an elongated slot 24' provided in the under surface of a rod actuation member 24 which is positioned on the punching rods 7 at the rear end portions of the latter and extends between the side plates 1 and 1 over the rear reinforcing bar 3 with the opposite ends terminating short of the side plates. The punching rod guide member 12 has an extension 12''' extending rearwardly and downwardly from the inner surface thereof and riding over the rod actuation member 24 whereby the rod actuation member 24 can advance and retract in slidable engagement with the rod guide member 12 carrying the rods 7 therewith when the member 24 is actuated in the manner as will become apparent hereinafter. Pins 25 and 25 extend outwardly from the opposite ends of the rod actuation member 24 and links 26 and 26 are pivoted at one end to the pins 25 and 25. The other ends of the links 26 and 26 are pivoted to pins 27 and 27 on arms 28 and 28 which are in turn pivoted at one end 28' to the pins 27 and fixedly mounted at the other end on a main shaft 29 which extends between the side plates 1 and 1 with the opposite ends suitably journaled in the side plates.

A double bent operation handle 30 extends from the main shaft 29 and has a rear end portion connected to and extending horizontally from the shaft 29, an intermediate portion extending from the other end of the rear end portion at an upwardly inclined angle along the outer surface of the right-hand support plate 1 and an upright portion extending from the other end of the intermediate portion and having a hand knob 30' for easy grip. A return spring anchoring projection 30 extends down from the shaft 29 at a point adjacent to the end of the shaft adjacent to the left-hand side plate 1 (as seen in FIG. 1) and a return spring 31 is anchored at one end to the projection 30. The other end of the return spring 31 is anchored to a pin 32 which extends inwardly from the left-hand side plate 1 so that the return spring normally urges the shaft 29 in the clockwise direction in which the parts of the punching rod actuation mechanism are held in their non-operative position and accordingly, the punching rods 7 are held in their

retracted position.

Numeral 33 denotes an adjustable L-shaped paper sheet aligning ruler which has a longer portion 33' extending along the perforated plate 8 above the upper edge thereof behind the left-hand paper stack guide piece 16, a shorter portion 33'' connected to the outer end of the longer portion 33' at right angles thereto and a leg 33''' extending down from the inner end of the longer portion 33' at right angles thereto. The lower end of the leg 33''' is secured to an adjustable support member 34 which has a dovetail bottom slidably received in the dovetail groove 12'' in the punching rod guide member 12 for adjustable movement between the slidable holders 17. Once adjusted, the support member 34 is held in position by a set screw. When a stack of loose leaf paper sheets (not shown) is inserted into the stack receiving opening 14, one side edge of the paper sheets are caused to abut against the shorter portion 33'' of the ruler 33 to be aligned thereby before they are perforated by the punching rods 7 so that precisely aligned holes can be perforated in the paper sheets. It will be understood that the position of the paper stack guide pieces 16 and the ruler 33 can be adjusted depending upon the size of the paper sheets to be perforated by the perforator of the invention.

In operation, a stack of loose leaf paper sheets are first inserted into the opening 14 until the lower edge of the stack lies on the shoulder 15 on the perforated plate 8 and then aligned by the abutment of one side edge of the paper sheets against the shorter portion 33'' of the ruler 33. Thereafter, the handle 30 is pushed down to rotate the shaft 29 in the counter-clock direction as seen in FIG. 2 against the force of the return spring 31. The rotation movement of the shaft 29 in the counter-clock direction causes the arms 28 having one end fixedly mounted on the shaft to pivot about the pins 27 and the pivotal movement of the arms 28 advances the punching rod actuation member 24 in the direction of arrow B as seen in FIG. 2 in slidable contact with the under surface of the punching rod guide member projection 12'''. As the punching rod guide member 24 is advanced in the direction of arrow B, the punching rods 7 are also advanced through the holes in the punching rod guide member 12 to pass into the aligned holes 9 in the perforated plate 8 to thereby perforate aligned holes in the paper sheets. After the perforation operation has been effected, the handle 30 is released whereupon the return spring 31 rotates the shaft 29 in the clockwise direction to return the moving parts to their original position. Thus, it will be understood that in the preparation stage of the perforation operation, it is only necessary to align one side edge of the paper sheets in a stack against the shorter portion 33'' of the ruler 33 because the upper and lower edges of the paper sheets can be automatically aligned when the lower edges of the paper sheets lie on the shoulder 15 on the perforated plate 8 after they have been inserted into the opening 14 to thereby eliminate time-consuming aligning procedure as necessary in the prior art perforators. Furthermore, since the pivotal support bar 5 is stowed within the region defined by the side plates 1 when the perforator is not used, the perforator of the invention occupies a smaller space than that of prior art perforators of the corresponding dimensions.

It is to be understood that variations and modifications of the invention may be made without departing from the scope of the invention. It is also understood that the scope of the invention is not to be interpreted

as limited to the specific embodiment disclosed herein, but only in accordance with the appended claims when read in light of the foregoing disclosure.

What is claimed is:

1. A perforator for perforating a stack of paper sheets which comprises an inclined perforated plate having a plurality of spaced holes therein and a recess in the inner surface extending down from an upper edge and terminating short of a lower edge of the plate to provide a stop for the stack of paper sheets to be perforated, an inclined perforated punching rod guide member positioned opposite to and parallel said inner surface of the perforated plate to define an inclined paper sheet stack receiving opening in cooperation with said recess, said punching rod guide member having a plurality of holes in alignment with the holes in the perforated plate, a plurality of reciprocally movable punching rods disposed in said holes in the punching rod guide member for advancing into and retracting from the holes in the perforated plate, a punching rod actuation member connected to said punching rods for advancing and retracting the rods, an interlocking mechanism, a handle operatively connected to said punching rod actuation member through said interlocking mechanism for actuating the rod actuation member, and a frontal support means which comprises a pair of parallel and spaced upright side plates and a horizontal pivotal support bar positioned adjacent to one of said side plates for pivotal movement between an operating position in which the support bar extends out of the region defined by the side plates and a stowed position in which the support bar is within said region.

2. The perforator as set forth in claim 1 wherein the axes of the holes in said perforated plate and the axes of said punching rods are disposed on an acute angle relative to horizontal when said perforator is disposed on a plane horizontal surface.

3. The perforator as set forth in claim 1 in which said pivotal support bar is pivotal from a position substantially parallel to said spaced upright side plates to a position substantially perpendicular to said spaced upright plates.

4. The perforator as set forth in claim 1 wherein said receiving opening is in the form of a slot having spaced parallel surfaces disposed at an acute angle relative to horizontal when said perforator is disposed on a plane horizontal surface.

5. The perforator as set forth in claim 1 wherein said punching rods are movable upwardly at an acute angle by said punching rod actuating member to effect perforation of said stack of paper sheets.

6. The perforator as set forth in claim 1, further including paper stack aligning means which comprises a stop provided at the bottom of said paper stack receiving opening and an adjustable aligning ruler for aligning the side edges of said paper stack and positioned adjacent to the upper edge of said paper stack receiving opening.

7. The perforator as set forth in claim 1, further including a paper stack guide means which comprises a pair of paper stack guide pieces extending upwardly from the upper edge of said paper stack receiving opening at substantially the same angle as the opening, and means providing for adjusting said pair of paper stack guide pieces relative to each other.

8. A frontal supported perforator for perforating a stack of paper sheets comprising a pair of parallel and spaced side upright plates, a front reinforcing bar ex-

tending between said side plates adjacent to the front edges thereof, a rear reinforcing bar extending between said plates adjacent to the rear edges thereof, a support leg pivoted to said rear reinforcing bar for pivotal movement between operative and non-operative positions, an inclined perforated plate extending between and supported by said side plates and having a plurality of spaced holes therein, said perforated plate having a recess in the inner surface extending downwardly from the upper edge and terminating short of the lower edge of the plate to provide a stop for said paper stack, an inclined punching rod guide member connected to said inner surface of the perforated plate in a position opposite to said recess to define an inclined paper stack receiving opening in cooperation with the recess and having a plurality of spaced holes in alignment with the holes in the perforated plate, said stop defining the bottom of said opening, a plurality of punching rods reciprocally received in the holes in said guide member for advancing into and retracting relative to the holes in the perforated plate, a punching rod actuation member connected to said punching rods for advancing and retracting the rods, a pair of adjustable paper stack guide pieces extending upwardly from the upper edge of said paper stack receiving opening at substantially the same angle as the opening, an adjustable ruler positioned above said paper stack receiving opening and behind one of said adjustable paper stack guide pieces with a portion thereof extending at right angles to the opening and adapted to be abutted by said paper stack for aligning the stack, an interlocking mechanism, and an operation handle operatively connected to said punching rod actuation member through said interlocking mechanism for actuating the actuation member.

9. A perforator for perforating a stack of paper sheets which comprises an inclined perforated plate having a plurality of spaced holes therein and a recess in the inner surface extending down from an upper edge and terminating short of a lower edge of the plate to provide a stop for the stack of paper sheets to be perforated, an inclined perforated punching rod guide member positioned opposite to and parallel said inner surface of the perforated plate to define an inclined paper sheet stack receiving opening in cooperation with said recess, said punching rod guide member having a plurality of holes in alignment with the holes in the perforated plate, a plurality of reciprocally movable punching rods disposed in said holes in the punching rod guide member for advancing into and retracting from the holes in the perforated plate, a punching rod actuation member connected to said punching rods for advancing and retracting the rods, an interlocking mechanism, a handle operatively connected to said punching rod actuation member through said interlocking mechanism for actuating the rod actuation member, a paper stack guide means comprising a pair of paper stack guide pieces extending upwardly from the upper edge of said paper stack receiving opening at substantially the same angle as the opening, means providing for adjusting said pair of paper stack guide pieces relative to each other, an adjustable ruler for determining the lateral position of said stack of paper, and adjustable means for adjusting the lateral position of said adjustable ruler, said adjustable means including a guideway in said punching rod guide member, said means for adjusting said pair of paper stack guide pieces including slidable elements slidable in said guideway.

* * * * *