April 28, 1964 W. F. ENO 3,130,622

DEVICE FOR CUTTING SHEETS

Filed June 13, 1961 2 Sheets-Sheet 1

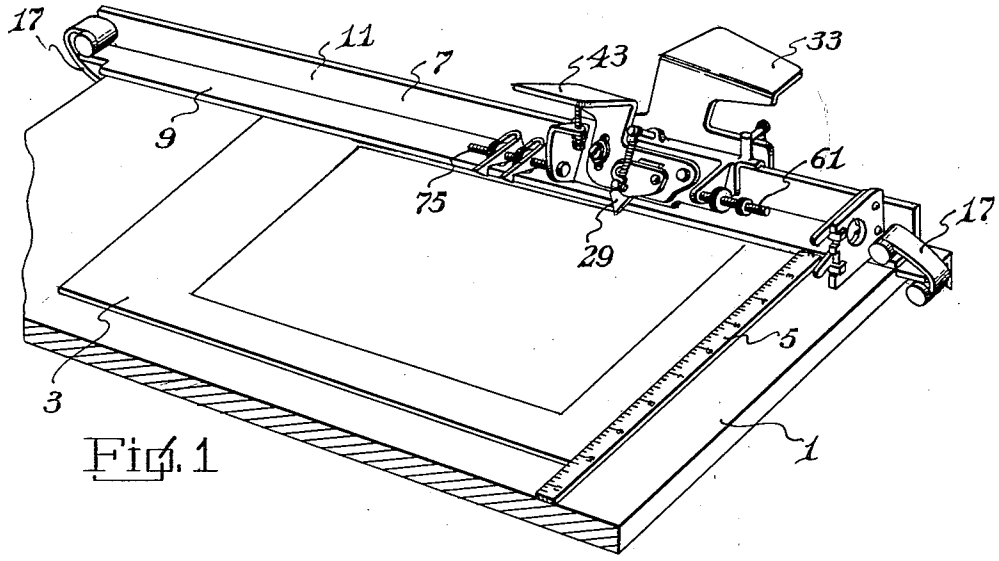


Fig. 1

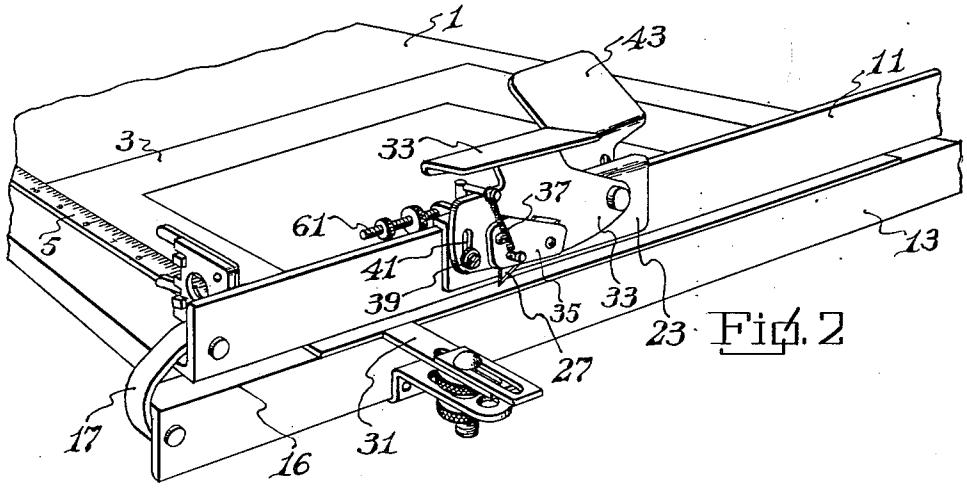
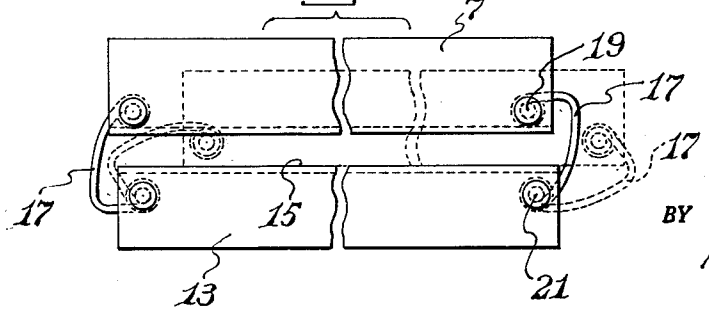


Fig. 2

Fig. 3



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Filed June 13, 1961 2 Sheets-Sheet 2

Fig. 4

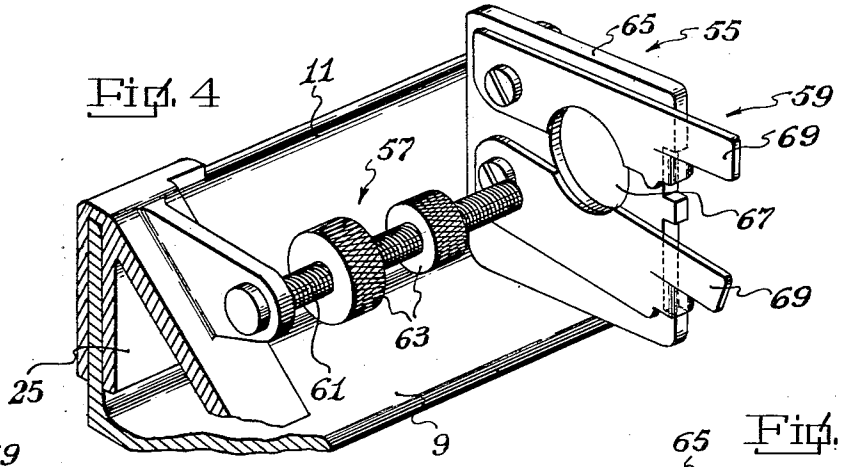
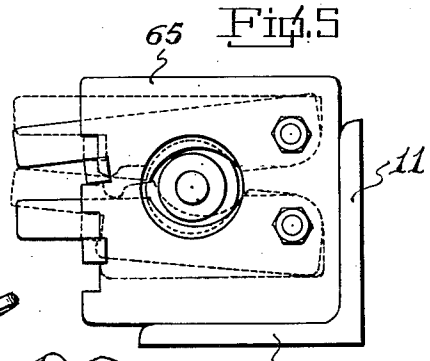


Fig. 5



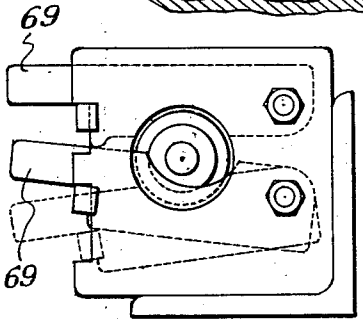


Fig. 6

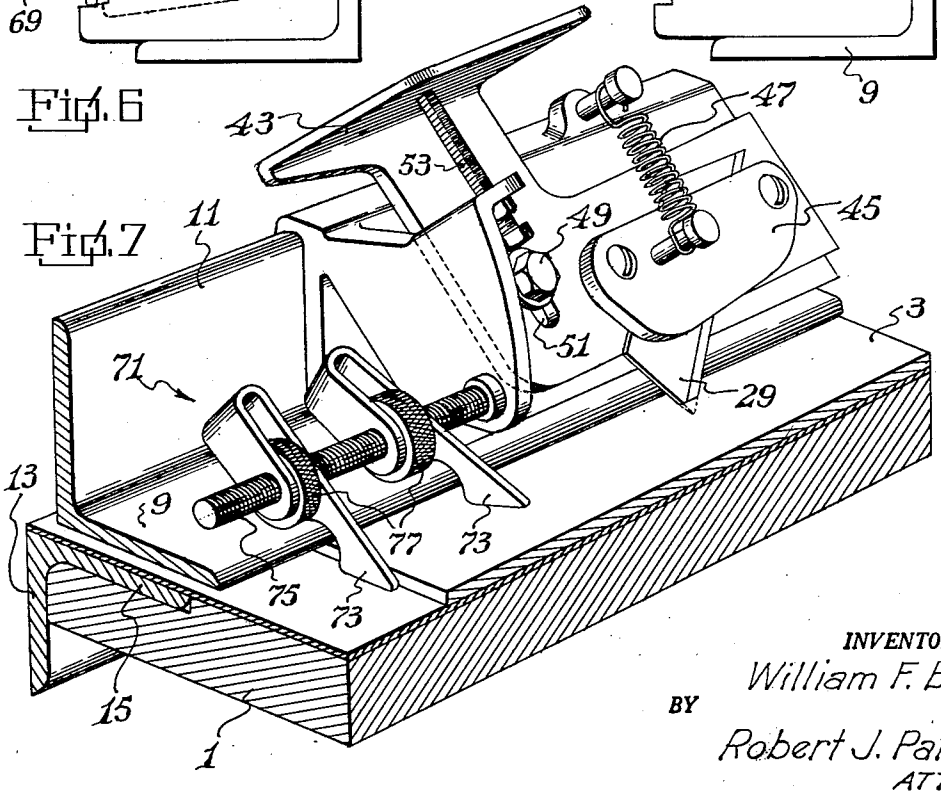


Fig. 7

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DEVICE FOR CUTTING SHEETS

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2 Claims. (Cl. 83—529)

The present invention relates to devices for cutting sheets, more particularly to such devices for cutting out a portion of the sheet within the outer contour of the sheet, as in the formation of picture mats.

It is an object of the present invention to provide such devices which make interior cuts in the sheet precisely parallel to the edges of the sheet.

It is another object of the present invention to provide such devices which both trim the edges of the sheet and also form interior cuts in the sheet, so as to assure parallelism between the interior cuts and the edges.

Still another object of the present invention is the provision of such devices designed to form cuts having starting points and/or end points which are located accurately predetermined distances from the edges of the sheet.

A still further object of the present invention is the provision of such devices adapted to serve both as sheet clamps and as sheet cutters.

It is yet another object of the present invention to provide such devices that are readily adjustable as to the length and location of the line of cut.

Finally, it is an object of the present invention to provide such devices which are relatively simple and inexpensive to manufacture, easy, accurate and reliable to operate, and rugged and durable in use.

Other objects and advantages of the present invention will become apparent from a consideration of the following description, taken in connection with the accompanying drawings, in which:

FIGURE 1 is a perspective view of a device according to the present invention viewed from one angle;

FIGURE 2 is a view similar to FIGURE 1, but showing the device from a different angle;

FIGURE 3 is a rear elevational view with parts broken away, showing the track in raised and lowered positions;

FIGURE 4 is an enlarged fragmentary perspective view of one of the stop means of the present invention;

FIGURES 5 and 6 are end views of the stop means of FIGURE 4 in various adjusted positions; and

FIGURE 7 is an enlarged fragmentary perspective view of the carriage and the other stop means of the present invention.

Referring now to the drawings in greater detail, there is shown a device for cutting sheets, comprising a table in the form of a flat board 1 on which a flat sheet 3 of paper or cardboard or the like is adapted to lie in supported relationship. The position of sheet 3 on board 1 is determined by a sheet edge stop in the form of a rule 5 secured to board 1 along one side thereof and parallel to one edge of the board. Rule 5 is provided with conventional inch markings.

Mounted for vertical movement on and relative to board 1 is a track 7 in the form of an angle member having a flat horizontal flange 9 parallel to the upper surface of board 1 and a flat vertical flange 11 perpendicular to the plane of the upper surface of board 1. Mounted on board 1 in opposed relation to track 7 is a cutter rail 13, of which a flange 15 has an upper surface coplanar with the upper surface of the remainder of board 1. The sharp outer dihedral angle of rail 13 lies along an edge 16 of the upper surface of board 1.

Track 7 is mounted adjacent and parallel to edge 16 by means of a pair of track hinges 17, one at each end of the board and track. Hinges 17 are rigid and are

pivotally secured at each end to pins 19 and 21 on track 7 and cutter rail 13, respectively, at the ends thereof. Hinges 17 are both of the same length, and thus provide a parallelogram linkage by which track 7 is vertically movable relative to cutter rail 13. In FIGURE 3, the full line position of the track is its raised position and the phantom line position of the track is its lowered position. Track 7 is raisable a distance greater than the thickness of a sheet to be cut; and hence, a sheet may be slipped under the track while the track is raised, and with the sheet positioned as desired against the end stop provided by rule 5, the track may be lowered to clamp the sheet to the table beneath the track.

Mounted for movement on and lengthwise of the track in a straight line is a carriage 23 having downwardly depending flanges 25 that snugly overlie and ride on flange 11 of track 7, thereby slidably to support the carriage on the track. The carriage is essentially a blade support and provides a mounting for a first cutting blade 27 on the side of the track opposite the major portion of board 1, and a second blade 29 on the other side of the track.

Blade 27 is a sizing blade, that is, it is adapted to trim the edges of the sheet so that the sheet is left rectangular and of a desired size. Blade 29 is supported on carriage 23 parallel to the direction of movement of the carriage on the track to make a straight clean cut through the sheet on the table, in cojunction with cutter rail 13. This is to say that blade 27 rides along the edge 16 so that the trimemd edge of the sheet is flush with the vertical face of rail 13. In order to determine where the cut of blade 27 should be made in the sheet so as properly to trim the sheet edge to leave a sheet of the desired size, it is provided that the graduations along rule 5 start with zero at edge 16, so that blade 27 cuts off the sheet at zero. Thus, for a sheet of a desired width, the sheet is simply laid on the board until its edge opposite the edge to be cut is in alignment with the marking of the desired width on rule 5, whereafter movement of blade 27 along the track cuts off the sheet to the desired length or width. For a plurailty of sheets of the same initial size, to be trimmed to the same final size, or for a plurality of sheets of various sizes from each of which a strip of constant width is to be trimmed, it is convenient to use a sheet edge stop 31 which is adjustable to various distances from the sharp edge of rail 13 and disposed in line with the plane of sheet 3.

Blade 27 is mounted for movement above and below the lower edge of the rail, that is, above and below the plane of sheet 3, so that the carriage may be positionally adjusted without effecting a cut when the blade is in raised position, but so that when the blade is lowered it will cut entirely through the sheet. To this end, a hand lever 33 is provided which is pivotally mounted at one end on carriage 23 for vertical swinging movement in sliding contact with the adjacent flange 25. Blade 27 is held flat against lever 33 and detachably secured in this position by means of blade clamp 35. A tension spring 37 acts between blade clamp 35 and a portion of carriage 23 continuously to urge blade 27 into a raised position in which it will be disposed above the sheet. Pressure of the hand downward on lever 33, however, swings lever 33 downward against the action of spring 37, so that blade 27 is disposed below track 7 and in cutting position. A detent 39 fixed to track 7 and riding in a slot 41 assures that blade 27 will not exceed its desired range of movement in either direction.

Blade 29 on the other side of track 7 is mounted in a somewhat similar way to blade 27. Thus, it is provided with a hand lever 43 swingable about one end between raised and lowered positions, and carries a blade clamp 45 beneath which blade 29 is releasably clamped to

the assembly. As before, a tension spring 47 acts between carriage 23 and blade clamp 45 continuously to urge lever 43 to raised position; and a detent 49 carried by carriage 23 rides in slot 51 to limit the extremes of movement of blade 29.

But blade 29 performs quite a different function from blade 27 in that it forms interior cuts, that is, cuts which do not extend from side to side of the sheet but which terminate within the margins of the sheet; and hence, the mounting of blade 29 differs from that of blade 27 in two significant respects. The first difference is that as the cutting edge of blade 29 is straight, it must be inclined upwardly in the direction of movement of blade 29 if it is to penetrate and pass through the paper, as will be best understood from a consideration of FIGURE 7. At the same time, however, it must be remembered that the end of the cut formed by blade 29 is also going to be the very beginning of a cut at right angles thereto, as it is not desired to provide intersecting cuts, but rather only cuts that are coterminous. But if the blade were disposed in a vertical plane with its cutting edge upwardly forwardly inclined, it is obvious that the two cuts would meet askew, that is, either the top of the cuts would just meet and the bottom of the cuts would fall short of meeting, or else the bottom of the cuts would just meet and the top of the cuts would cross and pass beyond each oher. Either result would be undesirable, for in the former case a ragged chunk would be torn from the sheet when the cutout was removed, and in the latter case unsightly corners would be left which would give the impression that a messy cutting job had been done.

Hence, a feature of the present invention comprises inclining the cutting edge of the blade so that it will leave an end portion of the cut which just meets with the beginning portion of the adjacent cut. This is to say that the front or cutting edge of the lowest tip of blade 29 leaves the cut at the very same location that the rear edge of the cutting point of blade enters the next cut perpendicular to the first cut. In this way, a perfectly clean corner is left without unsevered bridging material and without cuts that extend beyond the margins of the cutout. For this purpose, the surface of carriage 23 against which lever 43 slides is inclined downwardly inwardly of the table, that is, downwardly away from the trimmed edge of the sheet, at for example an angle of 45°. Thus, the pivotal axis of lever 43 is inclined diagonally upward away from cutter rail 13, so that blade 29 moves diagonally upward away from the sheet and diagonally downward toward the sheet.

The other feature as to which the mounting of blade 29 differs essentially from that of blade 27 concerns the depth to which blade 29 may cut. In the case of blade 27, which trims the sheet from end to end, it makes no difference how deeply the blade penetrates nor how far down below the track it extends. But in the case of blade 29, the depth of cut is quite important, not only because blade 29 cuts against a solid surface, but also because in view of the inclination of the edges of blade 29, the depth of cut to some extent governs the length of cut. Accordingly, means are provided for regulating the depth to which blade 29 cuts, comprising a depth-adjustment screw 53 screw-threadedly received in a shoulder of carriage 23 and bearing against an undersurface of lever 43, so that upon turning of screw 53, the position of the abutment provided by the end of the screw will be altered, thereby to alter the distance lever 43 may be depressed, thereby correspondingly to alter the depth of cut of blade 29.

It is quite important to regulate the distance blade 29 may travel, thereby precisely to control the length of the interior cut it makes. For this purpose, stop means are provided, including a first stop means as seen in FIGURES 4, 5 and 6 and indicated generally at 55. Stop means 55 is designed to regulate the position of the end of the cut, and comprises a portion 57 carried by the carriage and a portion 59 in unitary assembly with the board.

Portion 57 includes a screw-threaded shank 61 mounted at one end on the carriage and extending parallel to the direction of movement of the carriage away from the carriage and toward rule 5. Shank 61 has a plurality of nuts 63 thereon of different diameters, the diameters of the nuts decreasing progressively from the carriage end of shank 61 toward the free end of shank 61. Portion 59 of the stop means includes an upright plate 65 having an opening 67 therethrough, the axis of which is horizontal and parallel to track 7. Mounted on either side of opening 67 are blades 69 in the nature of diaphragm stops. Each blade 69 has two operative positions: an upper position and a lower position, determined by shoulders on plate 65. When upper blade 69 is in its upper position and lower blade 69 is in its lower position, as seen in FIGURE 4, opening 67 remains substantially its original size. But when upper blade 69 is moved to its lower position, as seen in FIGURE 5, then it closes just enough of opening 67 so that the small nut 63 to the right of FIGURE 4 can pass beneth upper blade 69, but not the larger nut. However, when lower blade 69 is in its upper position, as seen in FIGURE 6, then it stops even the smaller nut 63. Means are thus provided for stopping the movement of carriage 23 to the right as seen in FIGURE 1 selectively according to the position of either or any of nuts 63, by selective adjustment of at least one of blades 69.

Means are also provided for regulating the position of the other or beginning end of the cut; and these means are best seen in FIGURE 7 as comprising a second stop means 71 including a plurality of detent 73 pivotally mounted on a screw-threaded shank 75 and adjustable lengthwise of shank 75 by means of adjustment nuts 77 so as to have raised inoperative positions as shown by the righthand detent 73 in FIGURE 7, or lowered operative positions shown by the lefthand detent 73 in FIGURE 7. Shank 75 extends horizontally parallel to the path of movement of carriage 23 away from carriage 23 and away from rule 5, that is, in the opposite direction from shank 61. In their raised positions, detents 73 pass above the sheet without touching the edge of the sheet. But in their lowered positions, detents 73 contact the edge of the sheet upon movement to the right as seen in FIGURE 7, thereby accurately to position blade 29 relative to the adjacent edge of the sheet.

The position and orientation of blades 27 and 29 relative to each other is also important. It will be noted from a comparison of FIGURES 1 and 2 that the cutting edges of blades 27 and 29 are disposed in opposite directions. Blade 29 cuts when carriage 23 is moving to the right as seen in FIGURE 1, while blade 27 cuts when carriage 23 is moving to the right as seen in FIGURE 2, that is, in the opposite direction from FIGURE 1. Thus, the edge-trimming stroke is made in one direction with carriage 23, while the cutting out strokes are made in the opposite direction of movement of carriage 23. This arrangement is not arbitrary but has a definite purpose. Also, blades 27 and 29 are spaced apart lengthwise of the path of travel of carriage 23, with blade 27 substantially closer to rule 5 than blade 29, so that when carriage 23 is in its extreme right position as seen in FIGURE 1, sizing blade 27 will be out of contact with that edge of sheet 3 which is disposed against rule 5, that is, blades 27 and 29 will be disposed on opposite sides of that edge, with blade 29 disposed within the contour of the sheet and blade 27 disposed outside the contour of the sheet. These arrangements, also, are not arbitrary but rather serve a definite purpose. The positioning of blade 27 outside the contour of the sheet when the carriage is in the extreme right position enables blade 27 to begin its trimming cut at the very edge of the sheet. The positioning of blade 29 within the contour of the sheet in the extreme right position assures that blade 29 will not cut through as far as a trimmed edge of the sheet. First stop means 55 prevents further movement of carriage

23 to the right as seen in FIGURE 1; while second stop means 71 does not positively limit movement of the carriage in the opposite direction; instead, stop means 71 merely provides an indicator by which the desired initial position of the carriage may be set. Thus, there is nothing to stop movement of blade 27 to the right as seen in FIGURE 2 until it comes to the very end of the track, so that sheets of any length may be completely trimmed. However, stop means 55 positively stops blade 29 from extreme movement in the opposite direction; and hence, it will be seen that it is important that blades 27 and 29 move in opposite directions to perform their cutting operations. It will also be seen why stop means of the nature of stop means 55 would be unsuitable for use in place of stop means 71, for they would limit the action of blade 27. On the other hand, it will be apparent why stop means in the nature of stop means 71 would not be suitable in place of stop means 55, for they would not positively prevent cutting movement of blade 29 beyond a desired point.

Moreover, it will be evident why it is desirable to have blades 27 and 29 on opposite sides of carriage 23, inasmuch as the interior cuts are to be spaced at least some distance from the trimmed edges but parallel thereto, and inasmuch as the track between the blades may thus serve as a clamping member for the sheet even when a large portion of that sheet is to be cut out.

The operation of the device will now become apparent. With track 7 raised, a sheet is positioned on the board against rule 5 with the lower edge of the sheet as seen in FIGURE 1 positioned at that point along the indicia of rule 5 which marks the desired width of the sheet. Track 7 is then depressed to clamp the sheet in this position, and with carriage 23 at the extreme right position of FIGURE 1, hand lever 33 is pushed down to depress blade 27, and the carriage is pushed to the right as seen in FIGURE 2, thereby trimming the edge. Assuming a picture mat is to be cut, with one-inch margins at the top and sides and a two-inch margin at the bottom, nuts 63 and 77 are set at an appropriate place along their respective shanks 61 and 75, just one inch apart from each other. Both blades 69 are placed in their lowermost positions so that the upper blade is positioned as shown in FIGURE 5 to let the smaller nut 63 through but to stop the larger nut 63. The left-hand detent 73 as seen in FIGURE 7 is depressed while the right-hand detent 73 is raised. Carriage 23 is then returned toward the right as seen in FIGURE 1 until the depressed detent 73 contacts the edge of the sheet. Hand lever 43 is depressed until it contacts depth adjustment screw 53, and the parts have the position exactly as shown in FIGURE 7. Exerting downward pressure on lever 43, carriage 23 is then drawn to the right as seen in FIGURE 1, thereby effecting the cut which is shown being made in FIGURE 1. Because of the position of detent 73, this cut will begin two inches from the left margin of the sheet as seen in FIGURE 1. Because of the position of nuts 63 and blades 69, this cut will end one inch from the right margin as seen in FIGURE 1. Track 7 is then raised and the second edge is trimmed as before. If it is desired to space the trimmed edge and the interior cuts apart from each other by a distance other than the normal distance between blades 27 and 29, the position of the sheet can be set once for trimming and then set a second time for interior cutting by the use of edge stops 31. To form this second interior cut, with each end spaced one inch from the adjacent sheet edge, it is obvious that the setting of stop means 55 may be left the same. But the setting of the second stop means 71 is changed, so that the right-hand detent 73 as seen in FIGURE 7 is depressed. Thus, the second cut begins only one inch from the adjacent sheet edge and ends as before, one inch from the opposite sheet edge. To form the third cut, which is the lowermost interior cut as seen in FIGURE 1, the setting of second stop means 71 is preserved the same so as to begin the cut one inch from the edge, but the setting of first stop means 55 is altered so as to terminate the cut two inches from the adjacent edge. For this purpose, the lowermost blade 69 is raised to the position shown in FIGURE 6 so that the smaller nut 63 cannot pass through opening 67. The fourth cut is then made with the same setting as the second cut but either with edge stop 31 in use to accommodate the extra inch of mat edge, or with the end edge of the sheet positioned one inch farther along the indicia of rule 5. Upon completion of the fourth cut, the central cutout portion of the mat can be lifted out with no rough edges and with the sheet perfectly rectangular and the edges of the cutout perfectly rectangular and parallel to the edges of the sheet.

From a consideration of the foregoing, it will be obvious that all of the initially recited objects of the present invention have been achieved.

It is to be understood that the appended claims are to be accorded a range of equivalents commensurate in scope with the advance made over the prior art.

What is claimed is:

1. A device for cutting in sheets rectangular holes of which the marginal edges are of two different lengths, comprising a table, an elongated straight track mounted on the table, a carriage mounted on the track for movement lengthwise of the track, a cutter blade carried by the carriage and disposed parallel to the path of movement of the carriage on the track to make a straight cut in a sheet upon movement of the carriage along the track, and stop means for limiting movement of the carriage along the track, the stop means having a portion carried by the carriage and a portion in unitary assembly with the table, one of said portions having a pair of detents spaced longitudinally of the track and selectively engageable with abutment means on the other of said portions selectively to regulate the position of one end of the cut in the sheet so that a pair of opposite marginal edges of the hole can be cut with the abutment means and one of the detents approaching and contacting each other and the other pair of opposite marginal edges of the hole can be cut with the abutment means and the other detent approaching and contacting each other, one of said abutment means and detents having a portion movable transversely of the track to select the desired detent without the need for adjusting the position of either detent lengthwise of the track during the cutting operation.

2. A device as claimed in claim 1, and further stop means including a pair of detents spaced longitudinally of the track for selectively regulating the position of the other end of the cut in the sheet.

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