Jan. 23, 1951 R. L. SJOSTROM 2,538,984

SHEET TEARING DEVICE

Filed April 5, 1946 5 Sheets-Sheet 1

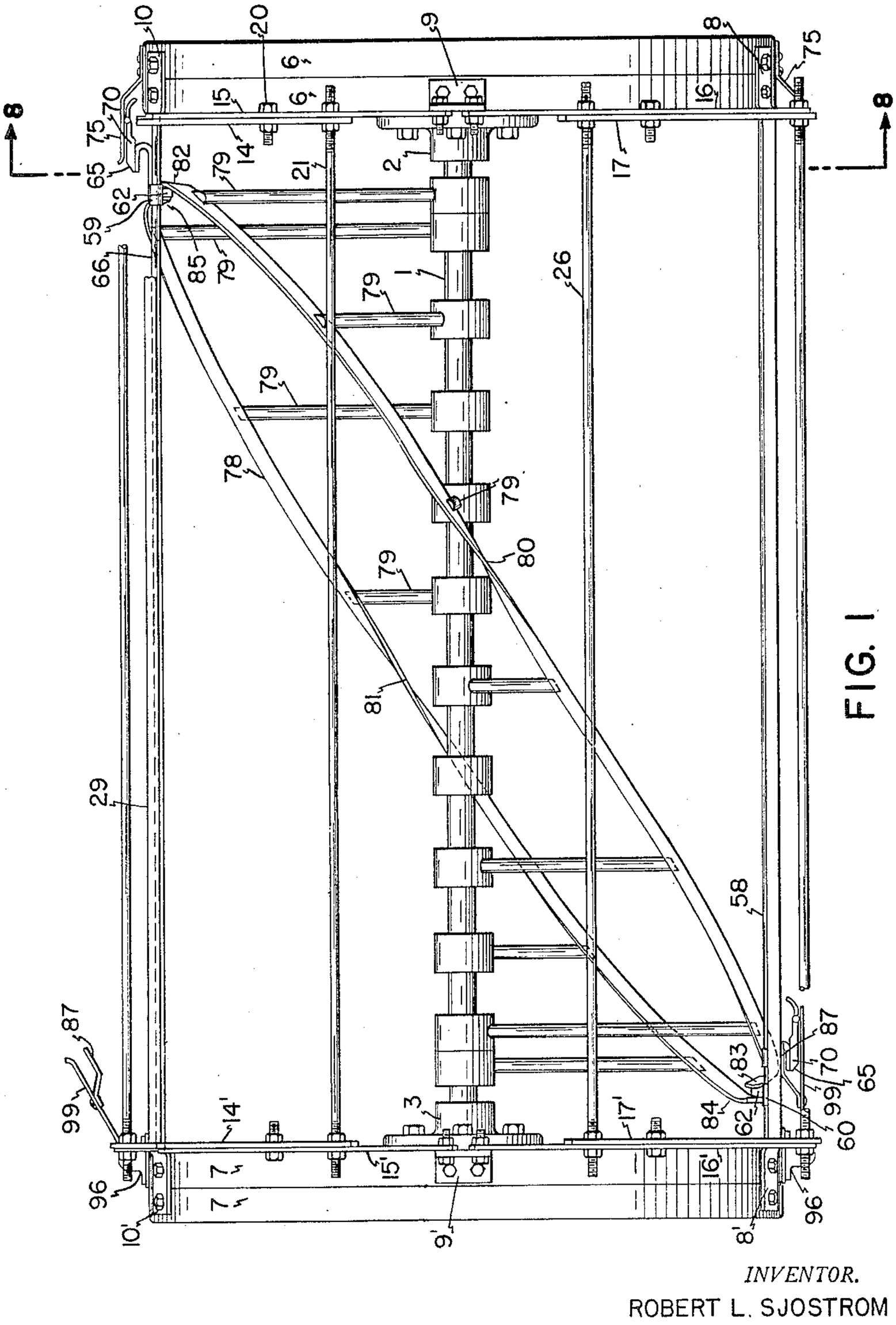

FIG. 1

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SHEET TEARING DEVICE

Filed April 5, 1946 5 Sheets-Sheet 2

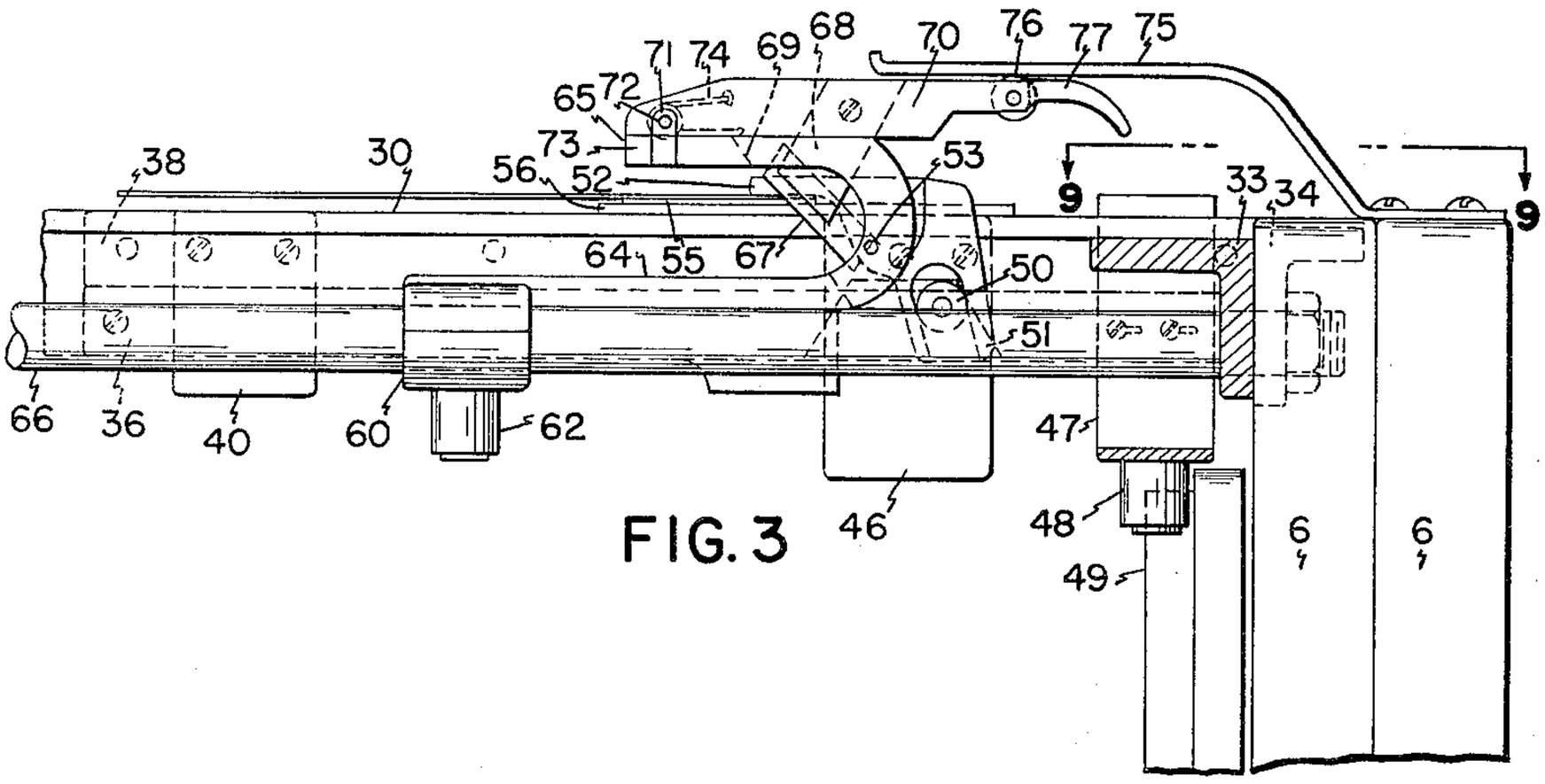

FIG. 3

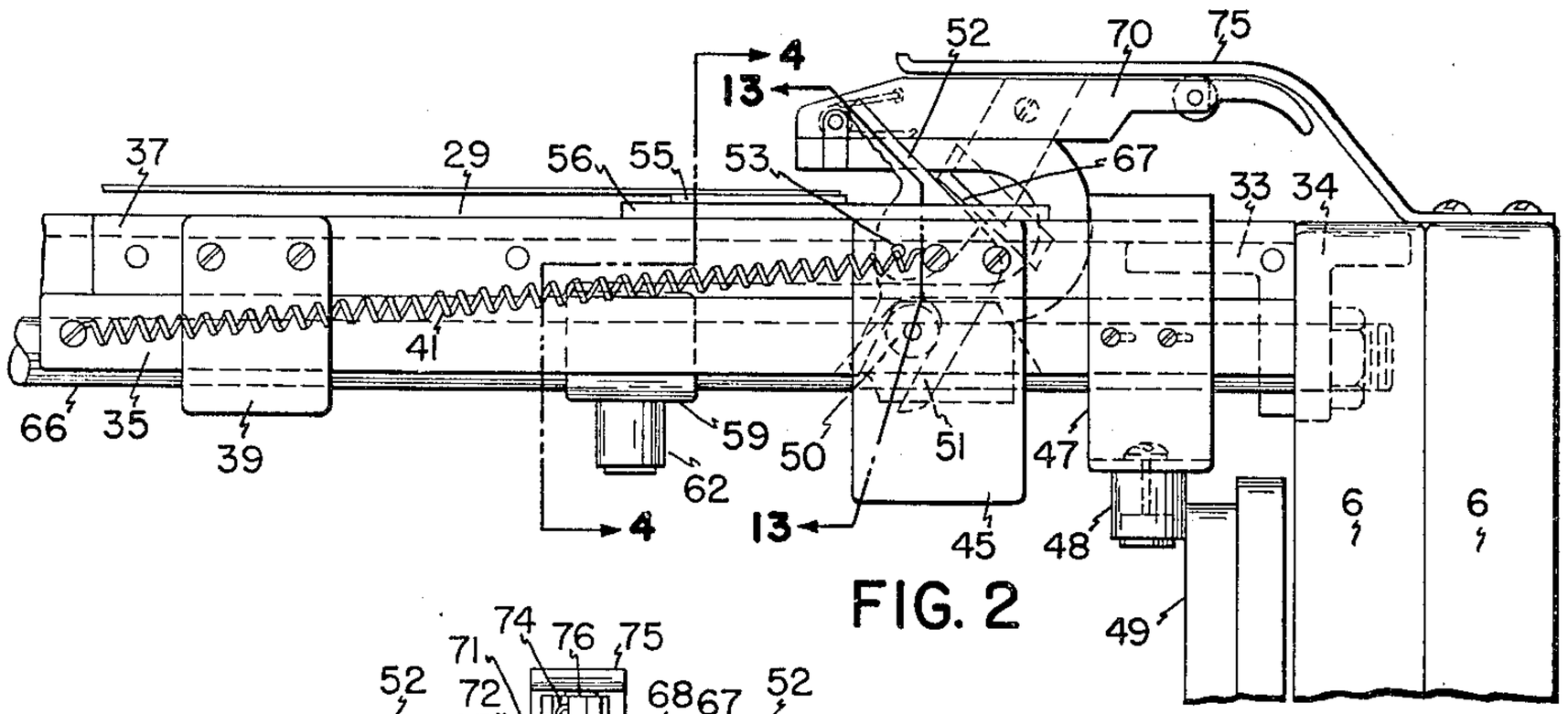

FIG. 2

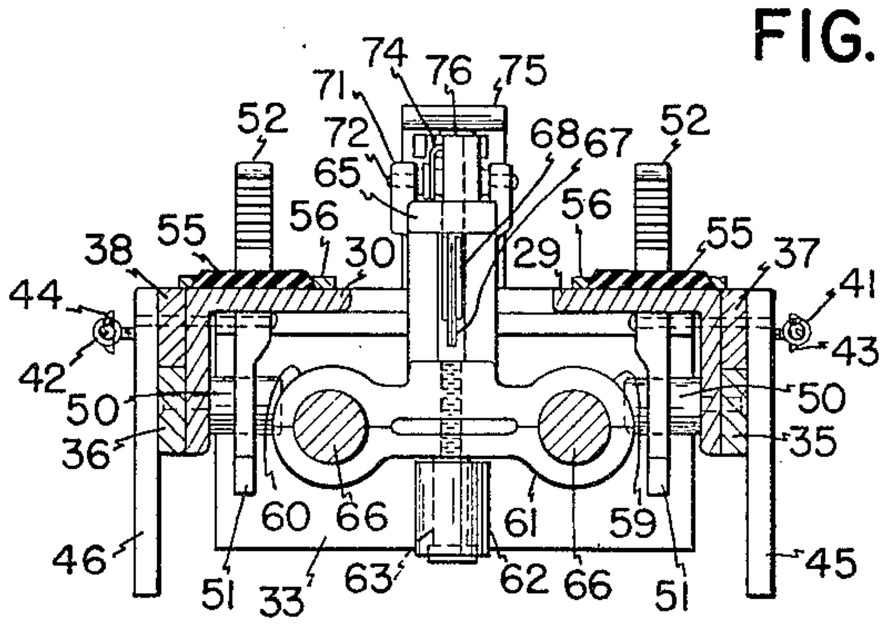

FIG. 4

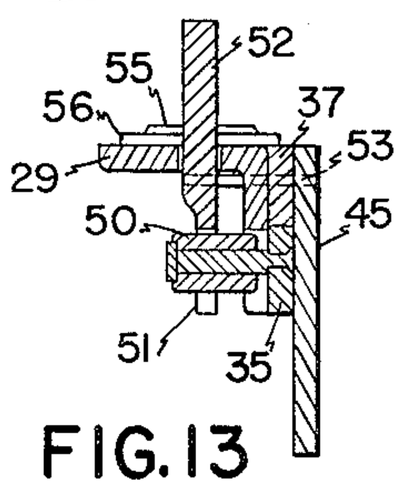

FIG. 13

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SHEET TEARING DEVICE

Filed April 5, 1946 5 Sheets-Sheet 3

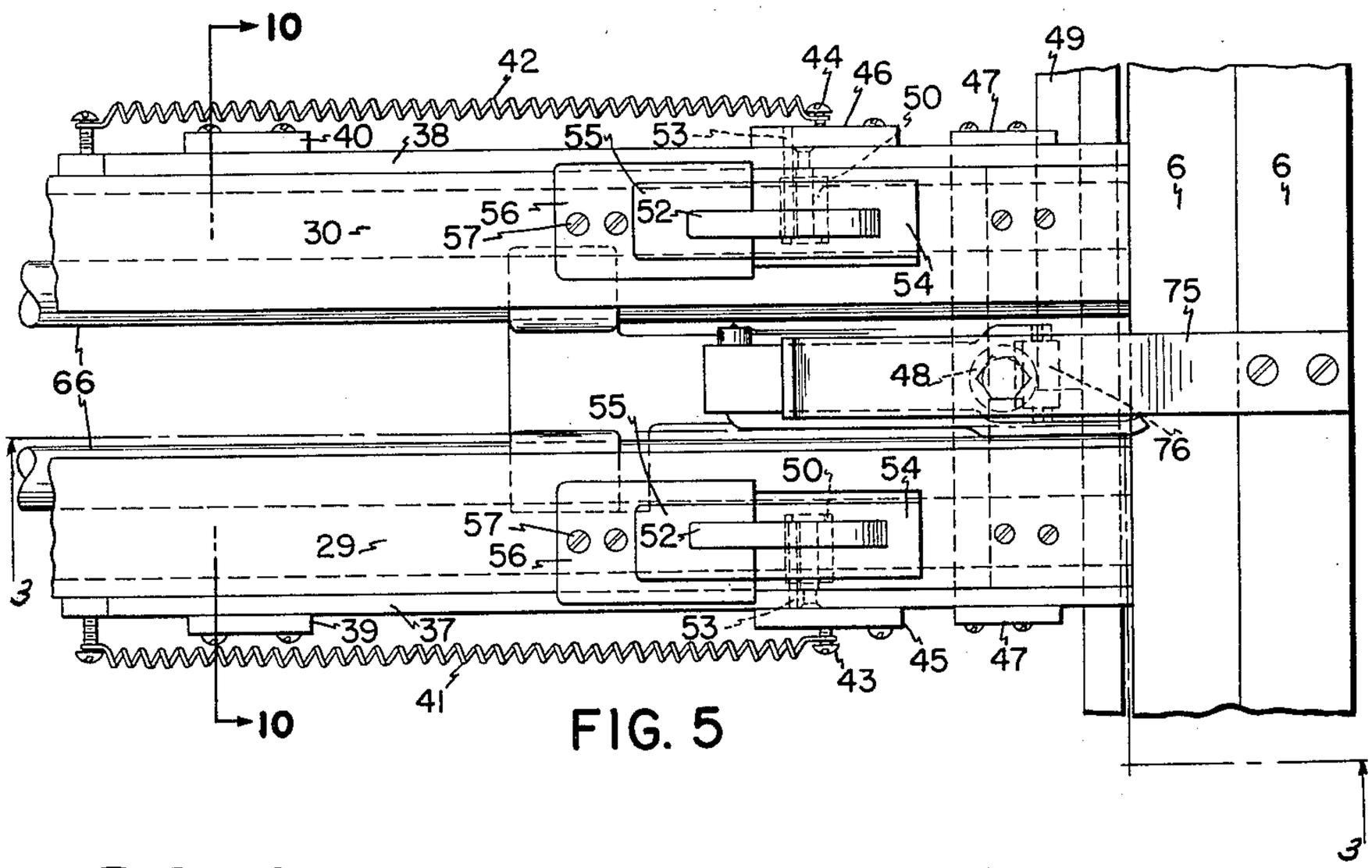

FIG. 5

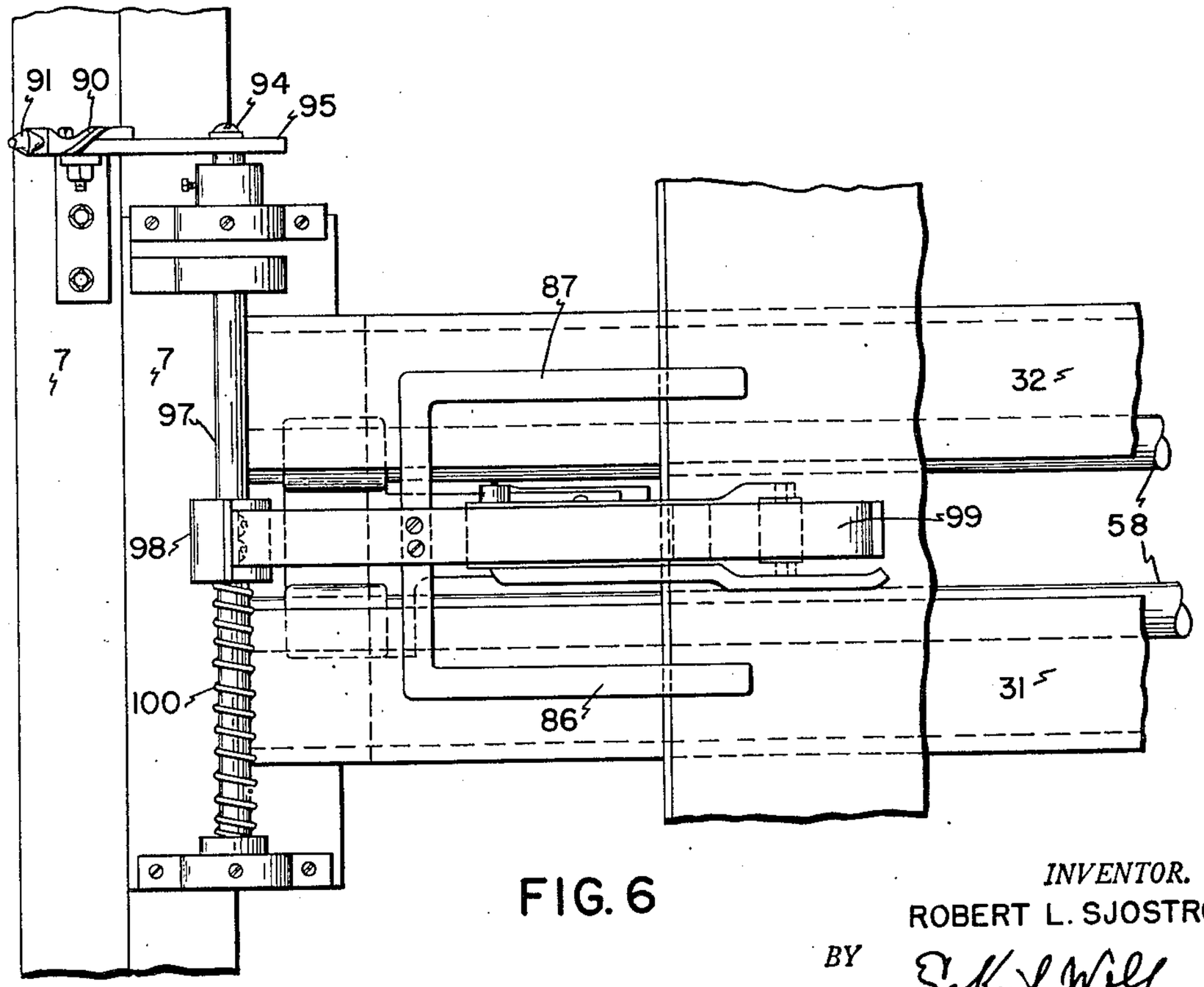

FIG. 6

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SHEET TEARING DEVICE

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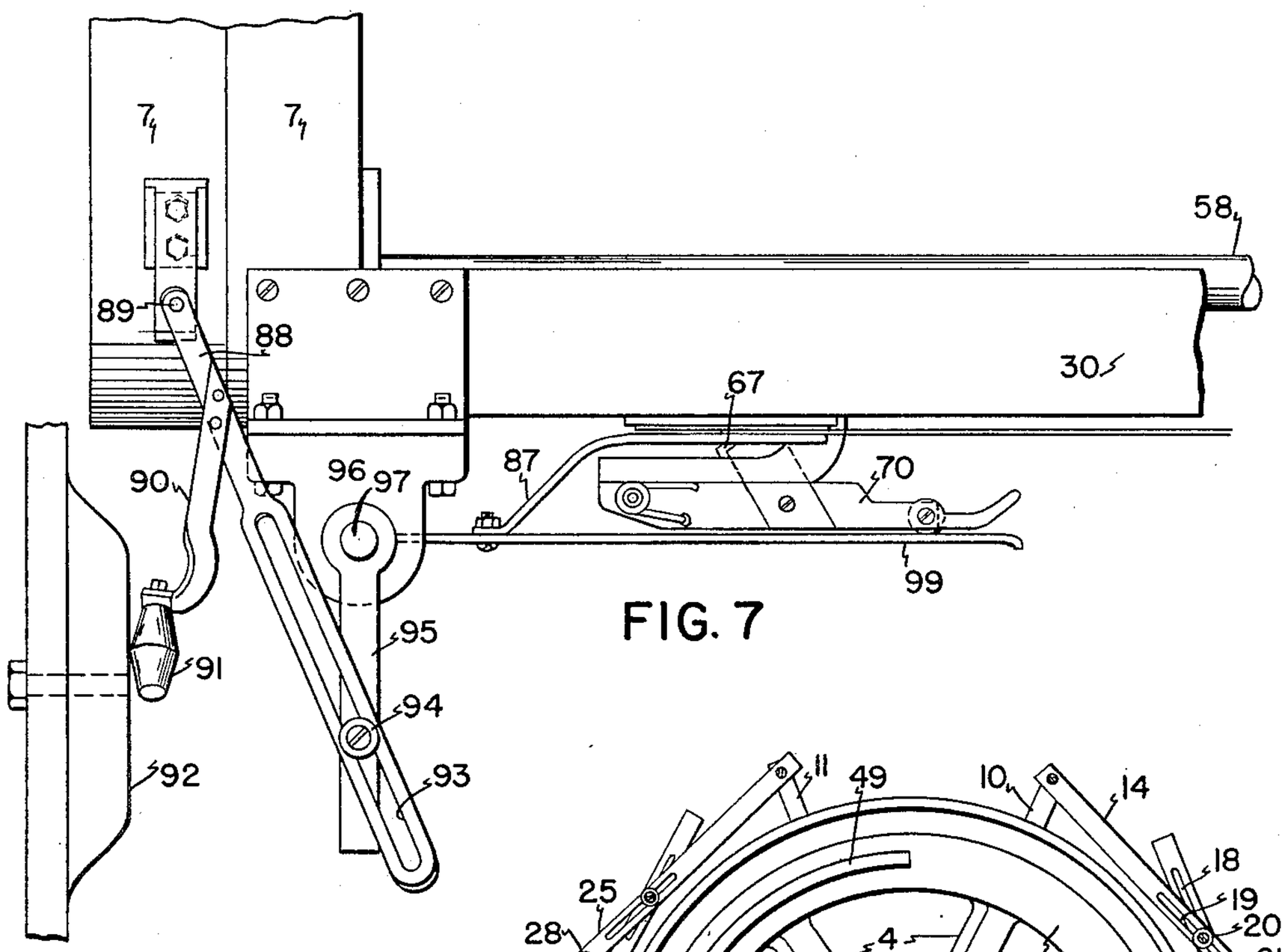

FIG. 7

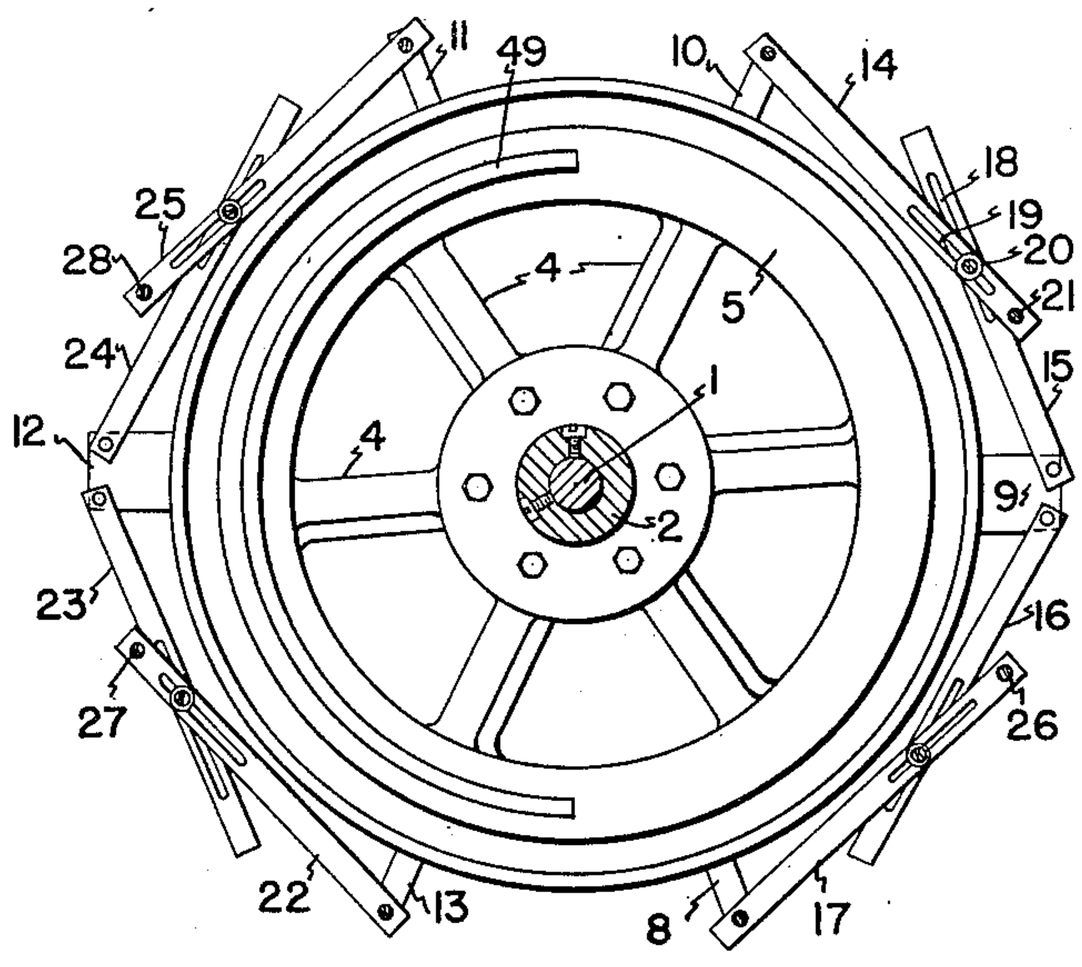

FIG. 8

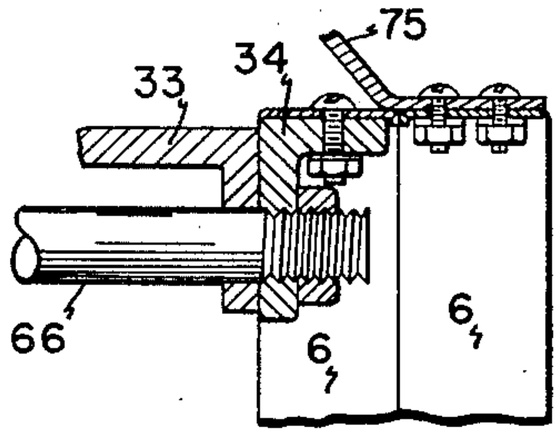

FIG. 9

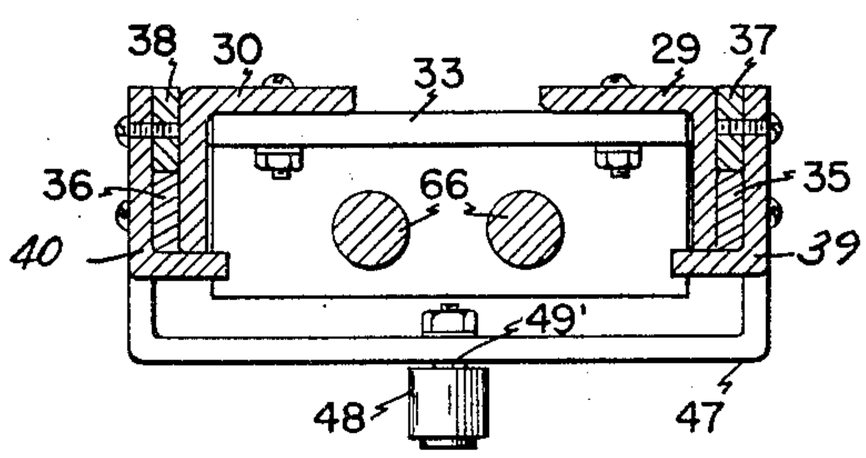

FIG. 10

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SHEET TEARING DEVICE

Filed April 5, 1946 5 Sheets-Sheet 5

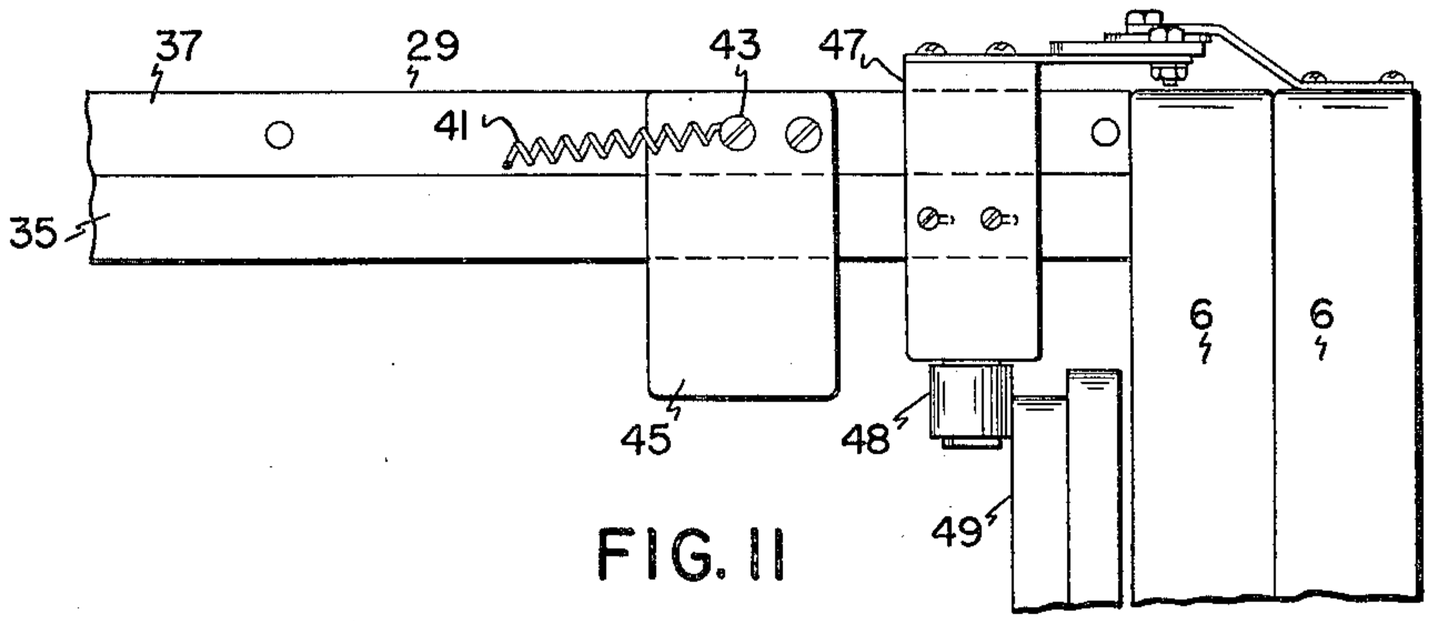

FIG. 11

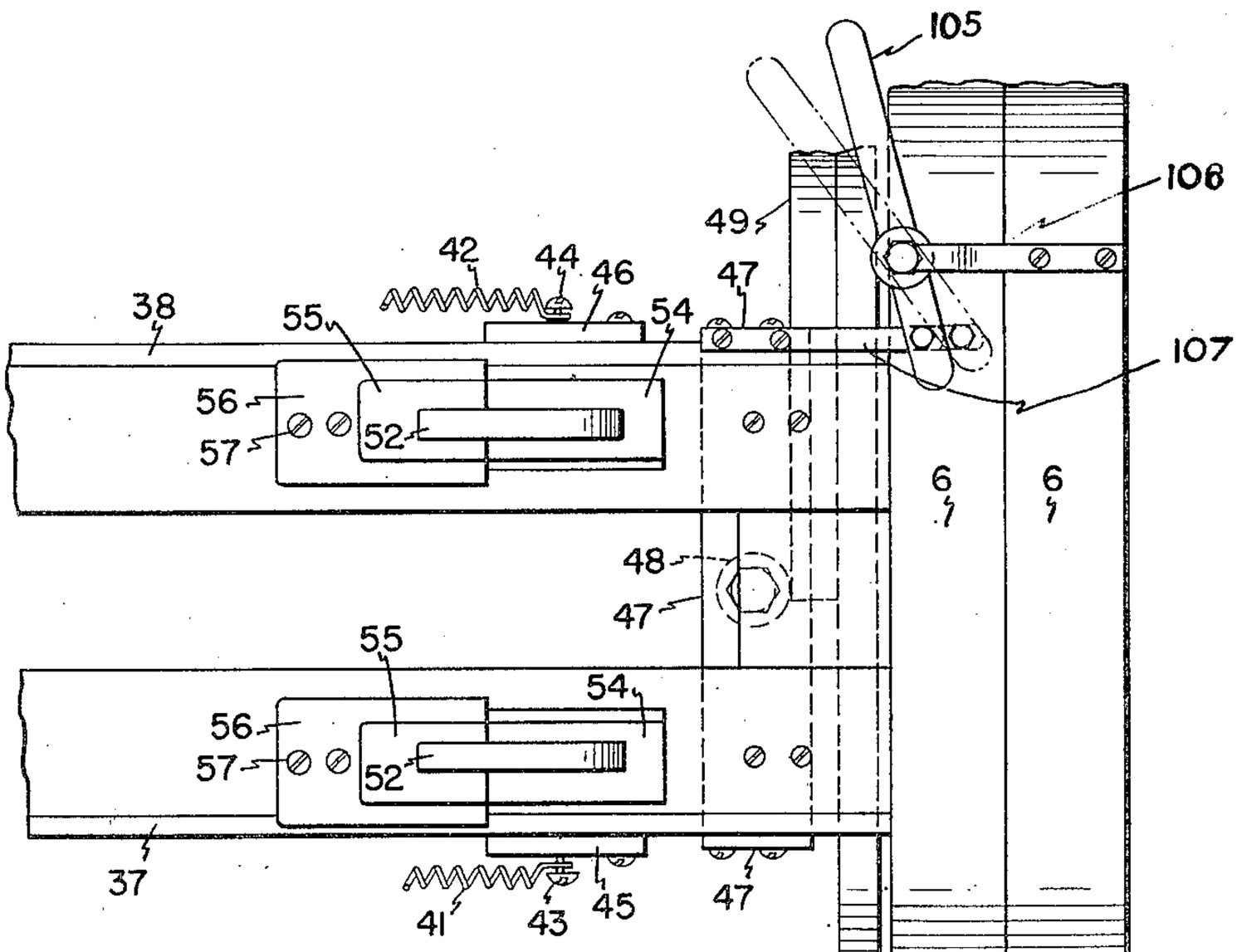

FIG. 12

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Patented Jan. 23, 1951 2,538,984

UNITED STATES PATENT OFFICE

2,538,984

SHEET TEARING DEVICE

Robert L. Sjostrom, Andover, Mass.

Application April 5, 1946, Serial No. 659,723

6 Claims. (Cl. 164—84.5)

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The present invention relates to a sheet tearing machine for the purpose of tearing woven sheets such as are ordinarily used for bed sheets, curtains and other types of material which it is desired to tear along a given thread.

It is common practice when a piece of material is to be severed from the strip, to cut the selvedge edge and then tear the material the rest of the way. This is done because the weft threads may not lie at right angles to the woof threads, and if the material were to be cut cross-wise, the cutting would sever a considerable number of weft threads. When the piece of cloth is then afterwards turned for hemming, it will be found that the hemmed edge will not be straight. In order therefore to keep the hemmed edge straight after the material has been straightened out, it is necessary in the first instance to sever the sheet from the roll or strip along substantially a single weft thread. The custom in most stores where yard goods are sold, is for the salesperson to snip the edge of the yard goods material and then tear the rest of it across. This method of cutting the cloth is almost generally used, perhaps with the exception of woolen goods which do not readily tear.

In the present invention, the cloth may be fed from a roll, bin or scray over a frame which holds the material at its edge and which carries the material forward in the rotation of the frame. The edge of the material is grasped and held by mechanical fingers and between the points of clamping or holding, the edge of the material is first cut and then torn apart cross-wise along a weft thread until at the end of the tearing the hemmed or selvedge edge is cut or severed from the piece by a knife blade.

In the present invention, the frame may be so adjusted that the desired length of the piece of material is severed from the strip. The process according to the present invention preferably is a continuous one in which the travelling, cutting and tearing mechanism operates alternately in pairs so that the material is fed at a continuous rate while the machine is in operation. The machine may be applied for cutting narrow materials or wide materials, such for instance, as sheets, which may be approximately 100 inches long.

While in the present invention the cloth is fed over a drum of a considerable diameter, it is possible to adapt the same type of mechanism for use on a flat feeding surface wherein the travelling mechanism for cutting and tearing cross-wise of the material is returned by means

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of a continuous belt instead of a circular frame which is of the nature of a continuous circular belt.

The present invention finds great utility in the manufacture of bed sheets, inasmuch as up to the present time sheets have been practically torn by hand. In the manual operation, the operator, even though he does not manually feed the sheets himself, must move back and forth from the beginning to the end of the sheet to locate the point of cutting and tearing, after which the sheet when torn must be removed to make room to bring the next sheet in position before marking and tearing can be done. As a result of this the manual operation is comparatively slow and correspondingly expensive. The machine of the present invention accomplishes the tearing completely automatically. The sheet lengths are automatically determined to such an accuracy that no adjustment or careful watch on the machine in its operation need be maintained. The goods after leaving the machine may be carried by a conveyor if desired by an air doffing mechanism or any other type of doffing mechanism which may deposit the sheets in flat or folded condition in a neat pile or stack.

The present invention will be more fully described in the specification below in connection with the drawings illustrating an embodiment of the invention, in which:

Figure 1 shows a side elevation of the invention with some of the stationary supports omitted.

Figure 2 shows a detail of an operation of the mechanism shown in Figure 1.

Figure 3 shows a general sectional view taken approximately on the section line 3—3 of Figure 5.

Figure 4 is a cross sectional view of a detail taken on the line 4—4 of Figure 2.

Figure 5 is a plan view of the mechanism shown substantially in Figure 2.

Figure 6 is a plan view of a detail of the mechanism shown in Figure 1 at the upper left hand part of the figure.

Figure 7 shows a detail of a portion of Figure 1 as viewed from and as shown on the left lower corner.

Figure 8 shows a sectional view taken substantially on the line 8—8 of Figure 1.

Figure 9 shows a detail taken on the section line 9—9 of Figure 3.

Figure 10 shows a detail taken on the line 10—10 of Figure 5.

Figure 11 shows a side view of the mechanism shown in Figure 12, and,

Figure 12 is a plan view of a detail as seen from the top of Figure 1, and

Figure 13 is a sectional view taken on the line 13—13 of Figure 2.

In the drawings there is provided a stationary frame providing a centrally located shaft 1 upon which the rotating mechanism is journalled. The central shaft 1 is supported by hubs 2 and 3 at either end of the device from which radiate the spider rods 4, 4, 4, upon which a flat circular ring 5 is supported. (See Figure 8.) This whole assembly may be supported by suitable brackets from the floor or elsewhere, these not being shown in the drawings.

The shaft 1 carries at each end a pair of pulley wheels 6, 6, at one end and 7, 7, at the other end, the pulleys being journalled to rotate on the shaft. The pulleys 6, 6, are bolted together and so also the pulleys 7, 7, and in fact a single pulley wheel may be substituted for each of the double pulleys. These pulley wheels are provided with a series of outwardly projecting brackets 8, 9, 10, 11, 12 and 13 on the pulley wheels 6, 6 (see Fig. 8), and a similar number on the pulley wheels 7, 7, only three of which, 8', 9' and 10' are shown in Figure 1. Pivoted to the brackets, 8, 9, 10, 11, 12 and 13 and their corresponding primes, are rods or bars 14 and 15, to the brackets 10 and 9 respectively, bars 16 and 17 to the brackets 9 and 8 respectively, and similarly arranged bars between the brackets 11, 12 and 13. Each pair of bars, to wit, 14 and 15 are provided with longitudinal slots 18 and 19 in which a threaded bolt and nut 20 is inserted whereby the bars 14 may be adjusted to bring the rod 21 carried near the end of the bar 14, closer to or away from the pulley. The bar 21 extends across the length of the machine and is supported in a similar mechanism in the corresponding bars 14' and 15' at the other end of the machine where the other pulleys 7, 7, are situated. Each pair of side bars 14, 15, 16, 17, 22, 23, and 24, 25, support similarly longitudinally extending rods 26, 27 and 28. If a longer length of material is to be cut then the rods 21, 26, 27, 28 are spaced further away from the pulley so that as the material is drawn over the frame, a longer length of material will be provided. The pulleys or short length drums at either end of the frame are connected to one another also by means of angle beams 29 and 30 comprising one pair shown at the top of the machine in the instantaneous position indicated in Figure 1. (See also Figures 5 and 10) and 31, 32 at the bottom of the machine in the instantaneous position indicated in Figure 1. (See also Figure 6.) These cross angle beams are supported at the ends by means of two angle brackets as illlustrated by 33, 34 (see Figure 3), which are placed back to back, being welded or otherwise attached together. The bracket, 34 as indicated in Figure 3 is attached or welded to the pulley 6. Similar methods may be used to attach the other supporting angle elements to the side pulleys. The angle elements 29 and 30 and the angle elements 31 and 32 are 180° opposite each other on the pulleys 6, 6, and 7, 7.

This supporting structure extending longitudinally of the machine is duplicated on opposite sides of the rotating frame and serves to carry the clamping mechanism for holding the cloth at one end of the machine as well as the cutting carriage which travels across the machine from one end to another in a manner which will be explained in greater detail below. In view of the duplication of the clamping fingers and the cutting carriage, only one of these elements will be described.

The angle brackets 29 and 30 have other outer faces to retain in free longitudinal movement the plates or bars 35 and 36 respectively. As indicated more clearly in Figure 10 at the top of each of the bars 35 and 36 are stationary spacer elements 37 and 38 and retaining angular guard elements 39 and 40. To the forward end of the bars 35 and 36 are attached one end of the long coil springs 41 and 42 respectively (see Figure 5), the ring ends of which springs are attached to pins or screws 43 and 44 respectively which are fixed in plates 45 and 46 respectively, which in turn are supported to the fixed angle elements 29 and 30. The springs 41 and 42 are normally held in tension so that the bars 35 and 36 as viewed in Figure 5, are forced to the right. These bars are attached together by means of a U shaped bracket 47 (Figures 2, 3, 10 and 11) on the base portion of which there is centrally mounted a roller 48 free to turn on a shaft 49'. This roller 48 bears against a ring cam 49 (see Figures 2, 3, 11 and 12), which as indicated in Figure 8 is slightly less than 180°. In the position indicated in Figure 2, the roller 48 engages the cam 49 and the bar 35 is pushed to the left, while in Figure 3 the roller 48 has passed beyond the ring cam 49 and the bar 35 is in a reciprocated position or towards the right. The bar 35 with which of course the bar 36 moves, each carry a pin or roller 50, projecting inwardly from the bars 35 and 36 respectively. These rollers or pins 50 engage the forked end 51 of the pivoted clamping fingers 52, the clamping finger being pivoted by a pin 53 in a supporting angle piece 29. The fingers 52 project through an opening 54 in the angle piece 29 and clamp down upon a rubber mat 55 set in a plate attached by screws 57 to the top of the angle pieces 29 and 30.

When therefore the rod 35 is pushed away from the pulley by the cam 49, the fingers 52 are raised and the cloth falls between the fingers and the clamping pads 55. When the roller 48 rides off the cam, the fingers come down and close to hold the edge of the cloth in position for cutting and tearing. It will be noted that the cam 49 ends near the top and bottom of the frame.

Between the two clamping fingers on the angle elements 29 and 30 is the cutting and tearing carriage as shown in Figures 1, 2, 3 and 7 in side view, and end view in Figures 4 and 10. Extending lengthwise of the frame between the cross supporting angles 29, 30 and 31, 32, are two pairs of rods, 66, 66 and 58, 58, the rods 66, being associated with the angle elements 29 and 30 (see Figure 5), and the rods 58 with the angle elements 31 and 32. Each pair of rods supports and carries the cutting carriage. The cutting carriage frame may be a cast or forged element with two collars or sleeves 59 and 60 which may be made in a lower and an upper half, as for instance 61 and 62 (shown in Figure 4) which may be clamped together around the shaft. At the bottom of the cutting carriage there projects a roller 62 which is free to turn about the axis of its supporting shaft 63. This roller 62 is always directed radially towards the central supporting shaft 1 because of the position of the supporting rods 66, 66. The cutting frame comprises, besides the sleeves or collars a U shaped supporting bracket 64 into which the cloth falls.

Initially in the start of the cutting and tearing

operation, the cutting carriage 65 is at the right end of the machine, as viewed in Figure 1, and the knife blade 67 projects into the bottom of the U. The knife blade may be of the razor type and clamped between plates 68 which extend through a slot in the end of the U shaped bracket, the edge of the slot being shown by the dotted line 69. The plates 68 are attached to a lever bracket 70, which at one end is provided with a bearing 71 through which a rod 72 is journalled which is attached to the upper exposed frame 73 of the U shaped bracket of the carriage.

A coil spring 74 with one end attached to the lever bracket 70 and the other end bearing against the outside of the U 73, serves to raise the lever bracket 70 upward in its normal position. In the position indicated in Figure 2, the cutting and tearing carriage has been brought over to its furthest position at the right and the bracket 70 has been forced downward by the guard member 75. Because of this the knife blade 67 is positioned diagonally across the cloth and extends lower down than the surface of the angle supporting brackets 29 and 30.

The fingers 52 are indicated as raised in Figure 2, but they are about to close and in the closed position then the cutting and tearing carriage will begin to move to the left as viewed in Figure 2. As this occurs, for instance as shown in the position in Figure 3, the fingers clamp the cloth and the cutting of the selvedge edge has occurred. As the carriage continues to move to the left in Figure 3, the lever 70 with its supported roller 76 and arm 77 will move clear of the guard 75, thus releasing the lever and permitting the knife 67 to be retracted out of the inner part of the U into the slot 69. The carriage will continue to move across to the left now tearing the cloth instead of cutting it. The mechanism by which the carriage is carried across the frame as it rotates with the frame is the elliptical cam 78 shown in Figure 1. This cam is supported by radial rods 79, 79, etc., mounted on the central shaft 1. The cam 78 is made in two halves and is formed in the shape of a half twisted ribbon, the plane of the cam ribbon always being radial with regard to the shaft 1. For this reason the cam will be provided with two twists 80 and 81. Each half of the cam overlaps the other half of the cam. This overlapping is alternate, the portion of the cam which is on the outer side at one end, as for instance at 82, is on the inner side at 83, and the portion of the cam which is on the outer side at 84 is on the inner side at 85. In this way the roller pin 62 will travel back and forth along the shafts 66 as it travels about the cam, always entering the gap between the places 82 and 85 and 83 and 84 respectively. In this way the cutting carriage is carried lengthwise of the machine from the right end, as indicated in Figure 3, to the left end as indicated in Figures 6 and 7. When the cam arrives at the left end the finishing operation occurs which comprises clamping the other edge of the cloth by means of the forked elements 86 and 87 and cutting the hemmed or second selvedge edge by means of operation of the cutting plate 67 by bringing down the supporting lever bracket 70. Attached to the pulley drum 7, 7, at the left of the machine, is a lever mechanism, comprising a lever bracket 88 pivoted to the surface of the pulley 7 in the pivot 89 which lever bracket 88 carries a projecting arm 90 with an operating roller 91 which comes against a fixed cam 92 attached

to the fixed portion of the frame at the desired point of operation. The lever bracket 88 is provided with a long slot 93 in which the pin 94 rides, which is attached to a lever crank 95 pivoted to a bracket 96 by means of the pivot 97. The bracket 96 is attached to the angle supporting beam 30. On the same shaft 97 is carried a collar 98 to which both the forked elements 87 and 86 are attached as well as the bar 99 which is adapted to force down the cutting lever 70. When therefore the roller 91 of the projecting bar 90 comes up against the cam 92, the shaft 97 is turned against the force of the spring 100 to bring down the cam fingers 86 and 87 on to the cloth and at the same time to bring the cutting knife through to cut the edge.

It will be noted that the cutting knife 67 comes down in the direction so that the cloth is cut at an inclined angle similarly as in the starting position.

The roller 62 continues of course to follow through the cam so that after the cutting is completed on the left end of the machine, it begins to follow back to the right end of the machine where the cycle is again started. In the meantime the other cutting knife begins its operation and when the first cutting carriage gets back to its starting position, the second cutting carriage has completed its operation.

It will be noted in the operation of the machine that at the beginning of the cutting cycle, the clamping fingers grip the cloth and retain this grip until the tearing carriage has completely travelled across the cloth. After this has occurred which takes one half of a revolution, the roller 48 rides on the cam 49 and releases the cloth. Since the cloth is held on both sides of the cutting edge, it is possible to tear the cloth to the exact length desired, since both ends of the cloth are held on the edge on which the cutting begins. The bight of the U frame does the actual tearing.

Besides the rods 21, 26, 27 and 28, four other cross rods are provided, 101, 102, 103 and 104, supported respectively by the brackets 10, 10', 8, 8', 13 and its corresponding bracket on the other end of the frame, (not shown) and 11 and its corresponding bracket on the other end of the frame (not shown). The goods will be drawn over these rods as well as the other rods in the rotation of the frame.

For manual operation of the fingers, the lever 105 is provided (Figure 12). This is pivoted in a bracket 106 supported by the pulley 6 with the short end of the lever connected to a link 107 which in turn is attached to the U shaped frame 40 carrying the roller 48 by means of which the bar 35 is moved. When the fingers are closed as occurs when the roller 48 is not riding on the cam 49, the bar 35 may be moved forward by pulling the lever handle 105 to the right in Figure 12, thus opening the fingers 52 for whatever purpose is desired. The rotatable frame may be turned by any suitable means as by pulley or gear drive from an electrical or mechanical source well known in the art.

Having now described my invention, I claim:

1. A sheet tearing machine comprising a rotatable frame, means for drawing the material to be severed from a continuous strip over the rotatable frame including a plurality of clamping fingers spaced apart on said frame for clamping one edge of the material to the frame, means for severing the material from the strip between the position of the clamping fingers and extending

transversely across the frame, said means including a cutting and tearing frame, means for initially operating said cutting means to cut one edge of the material, said tearing being accomplished by the travel of the carriage across the frame, and means for clamping the other side of the material on each side of the place to be severed and for operating the cutting means to cut the final edge of the material.

2. A sheet tearing machine comprising a rotatable frame, means for drawing the material to be severed from a continuous strip over the rotatable frame, including a pair of clamping elements at spaced intervals on said rotatable frame at the edge thereof, a cutting and tearing carriage positioned between said fingers, means for reciprocating said cutting and tearing carriage across the frame and means operable to close the clamping fingers and maintain the fingers closed while the carriage is travelling forward for cutting and tearing the material between the clamping fingers, and means operable at the other end of the machine for clamping the material at two spaced places on each side of the position of the cutting and tearing head as the cutting and tearing head arrives at that end of the machine.

3. A sheet tearing machine comprising a rotatable frame, means for enlarging and decreasing the size of the rotatable frame, means for drawing the material to be severed from the continuous strip over the rotatable frame including a pair of spaced clamping jaws spaced apart on said rotatable frame, a cutting and tearing head mounted for movement across the frame, means for moving the cutting and tearing head across the frame between the position of the clamping fingers, a second pair of clamping fingers mounted on said rotatable frame, means for maintaining the first pair of clamping fingers closed until the second pair of clamping fingers have grasped the material.

4. A sheet tearing machine comprising a rotatable frame, means for enlarging and decreasing the size of the rotatable frame, means for drawing the material to be severed from the continuous strip over the rotatable frame, including a pair of spaced clamping jaws spaced apart on said rotatable frame, a cutting and tearing head mounted for movement across the frame, means for moving the cutting and tearing head across the frame between the position of the clamping fingers, a second pair of clamping fingers mounted

on said rotatable frame, means for maintaining the first pair of clamping fingers closed until the second pair of clamping fingers have grasped the material, said first pair of clamping fingers remaining closed until the material has been severed from the strip.

5. In a sheet tearing machine, a mechanism for severing the sheet at the end edge including a tearing and cutting carriage having a U shaped bracket with the sides of the U positioned to envelope the material over the top and bottom and an arm pivoted to the U carrying a knife blade projecting from a slot into the bend of the U, spring means maintaining the knife clear from the bend of the U with the pivoted arm raised from the side of the U, a fixed cam, an operating lever carried adjacent the carriage at the end edge, having a clamping frame adapted to straddle the severing carriage and means operative when the operating lever comes in contact with the fixed cam for first bringing the clamping frame down on the material and then the knife blade into the bend of the U for finally severing the material.

6. In a sheet tearing mechanism, a rotatable frame, a pair of pivoted clamping fingers mounted on said frame, a plate positioned to be engaged by said fingers between which the material is clamped, a spring tensioned bar, means attached to said pivoted clamping fingers engaging said bar, a cam forming a part of a circle concentrically positioned with respect to said frame, means associated with said bar engaging said cam for maintaining said fingers in an open position during a portion of a revolution of rotation of said frame, for a little less than 180° of an arc.

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