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CLAMP MECHANISM FOR A PAPER CUTTING MACHINE

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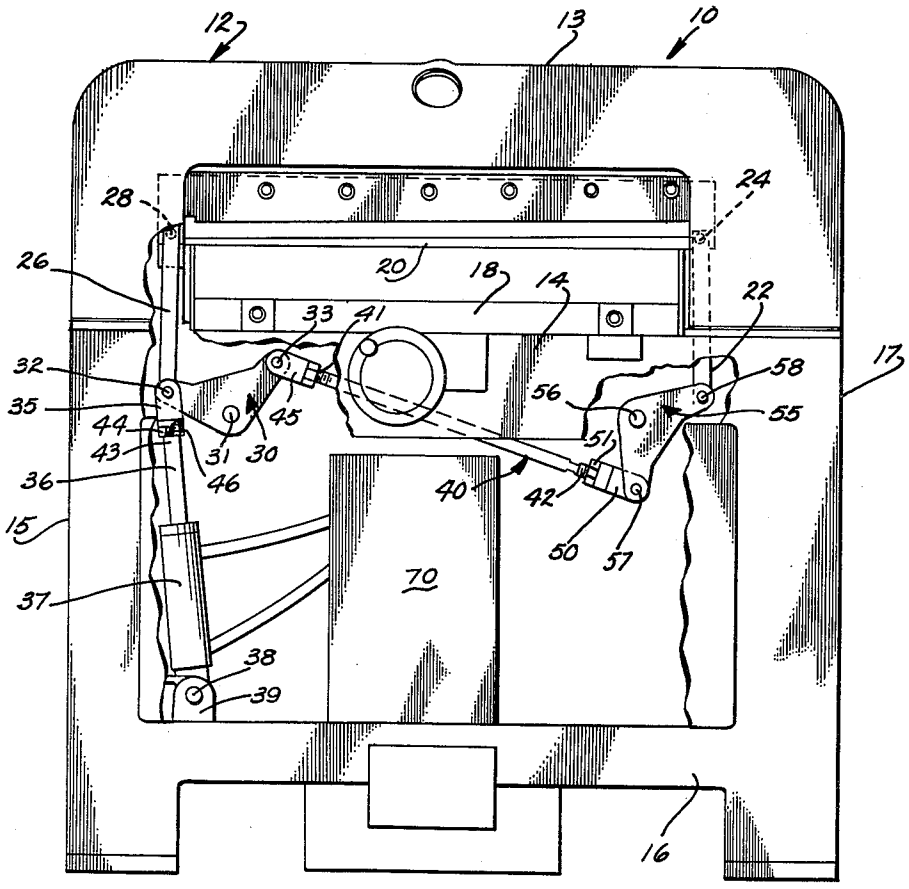



FIG. 1

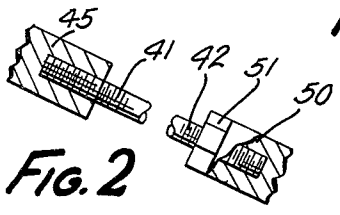



FIG. 2

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# CLAMP MECHANISM FOR A PAPER CUTTING MACHINE

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This invention relates to a clamping bar mechanism for a paper cutting machine, and more particularly to a mechanism for actuating and adjusting the same.

Most paper cutting machines have a clamping bar which is reciprocally mounted over the paper cutting table of the machine. The clamping bar is extended into engagement with paper supported by the table to clamp it in a fixed position during the cutting operation. Thereafter, the clamping bar is retracted to allow the paper to advance for another cutting operation or to allow removal of the paper from the machine.

Presently, various mechanical structures are utilized to extend and retract the clamping bar. One such arrangement utilizes a hydraulic cylinder which is placed over the paper cutting table and is connected to the clamping bar to actuate the same. One disadvantage of this structure is that the hydraulic cylinder is located directly over the paper cutting table. The hydraulic cylinder and its connecting lines are prone to develop a leak on occasion. When this occurs, the hydraulic fluid drips down on the paper or paper cutting table. Since paper is highly absorbent, it is immediately destroyed upon coming in contact with the hydraulic fluid.

Rack and pinion structures have also been utilized to extend and retract a clamping bar. A major disadvantage of this type of structure is that it is expensive and is also difficult to adjust. It is difficult to adjust because of the inherent amount of play between the teeth of the rack and pinion. Also, additional adjustment structure is needed to vary the position of the racks. The rack and pinion structure also occupies a great deal of space in the head of the paper cutter, causing a congested structure. The workman must work in close quarters, making the adjusting operation more difficult and time consuming.

The present invention overcomes one of the above problems by positioning the hydraulic cylinder below the paper cutting table. With the hydraulic cylinder below the paper cutting table, it is impossible for a leak in the hydraulic system to result in damage to the paper being cut. The difficulty of adjusting the position of the clamping bar present in previous structures has also been eliminated by placing the adjusting mechanism below the paper cutting table where it is readily accessible. The adjustment is accomplished by a rod which interconnects a pair of bell cranks. The length of the rod directly affects the level of the clamping bar, which is actuated by the bell cranks.

It is therefore an object of this invention to provide a clamping bar mechanism for a paper cutting machine wherein the clamping bar power cylinder actuator is located below the paper cutting table.

Still another object of this invention is to provide a calmping bar mechanism for a paper cutting machine which is adjusted by structure which is placed below the paper cutting table.

Yet another object of this invention is to provide a clamping bar mechanism for a paper cutting machine wherein the clamping bar of the mechanism is reciprocated into and out of engagement with the work piece by interconnected bell cranks.

Still another object of this invention is to provide a clamping bar mechanism for a paper cutting machine



wherein the rod connector between the bell cranks forms an adjustment means for leveling the clamping bar.

Another object of this invention is to provide a clamping bar mechanism for a paper cutting machine having a minimum number of component parts which are simple to manufacture and maintain.

These and other objects and advantages of this invention will become more apparent upon reading the following specification in conjunction with the accompanying drawings.

In the drawings:

FIG. 1 is a front elevation view of a paper cutting machine showing a portion of the frame cut away to reveal the clamping bar mechanism of this invention.

FIG. 2 is an enlarged perspective view of the clevises and the interconnecting rod.

Basically, this invention relates to the actuation and adjustment mechanism for a paper cutting machine clamping bar. The paper cutting machine has a frame with an intermediately disposed crosshead which supports the paper cutting table. A conventional clamping bar is guided by and positioned for reciprocal movement over the paper cutting table. A link is connected to one end of the clamping bar and to a bell crank which is pivotally mounted on the crosshead. The other end of the clamping bar is also provided with a link which is connected to a power bell crank, also pivotally mounted on the crosshead. The bell cranks are interconnected by an adjustable rod and the power bell crank is also connected to the actuator of a hydraulic cylinder. Operation of the hydraulic cylinder will rock the power bell crank which in turn rocks the transfer bell crank through the rod. The rocking movement of the bell cranks conveys a reciprocatory motion to the links which results in the extension and retraction of the clamping bar connected thereto. By shortening or lengthening the length of the rod between the bell cranks the level of the clamping bar is changed.

The cutter assembly is designated generally by the reference numeral 10. The assembly includes the clamping bar 20 (FIG. 1), the links 22 and 26, the power bell crank 30, the power cylinder 37, the connecting rod 40 and the transfer bell crank 55. A detent assembly 65 (FIG. 1) is carried by the clamping bar 20 and associates with the frame 12 which also supports the clamping bar assembly 20.

Referring more specifically to the details of the invention, FIG. 1 best shows the frame 12, now to be described. The frame 12 is a generally U-shaped or arch shaped member having a head 13 and legs 15 and 17. An upper crosshead 14 is formed between the legs 15 and 17 at a point approximately two-thirds the distance from the ends of the legs. The upper crosshead 14 supports one end of the cutting table 18 which is of conventional design. A space is formed between the top of cutting table 18 and the bottom of frame head 13. The cutting mechanism and clamping bar mechanism are located in this area. A lower crosshead 16 extends between the legs 15 and 17 and is positioned adjacent the end of the legs which rest upon a support structure such as a floor. The members of the frame 12 are preferably of a channel shape in cross section; however, it is to be understood that they may take other shapes and configurations.

The clamping bar 20 may be extended to a position where it is in engagement with the paper cutting table 18 and retracted to a position which is determined by the power bell crank 30, the transfer bell crank 55, and the rod which interconnects them in a manner which will be explained more fully hereinafter.

A link 22 has a bore which receives the pivot pin portion of fastener and pivot pin 24. The link 22 is thus

pivotally connected to the clamping bar 20. The link 26 is pivotally connected to the opposite end of the clamping bar 20 by similar structure not shown. The links 22 and 26 are similar in design and are elongated rectangular shaped members. They project downwardly through appropriate aperture means formed in the upper crosshead 14.

A power bell crank 30 is pivotally mounted on a pivot pin 31 which is supported by the upper crosshead 14. The power bell crank 30 is disposed within the channel portion of the upper crosshead 14. One end of the power bell crank 30 is connected to link 26 by pivot pin 32. Pivot pin 32 also connects a power cylinder clevis 35 to the power bell crank 30. A pivot pin 33 disposed at the other end of the power bell crank 30 pivotally connects a clevis 45 to the bell crank. The clevis 35 has a threaded bore 46 which is secrewed onto threads 43 formed on actuator rod 36 of power cylinder 37. A jam nut 44 is threaded on actuator rod threads 36 and engages the clevis 35 to lock it with respect to the actuator rod. The base of power cylinder 37 has a pivotal connection 38 with a bifurcated member 39 fixed to the lower crosshead 16.

The transfer bell crank 55 is pivotally mounted on a pivot pin 56 which is also supported by the upper crosshead 14. The pivot pin 56 is in horizontal alignment with the pivot pin 31 of power bell crank 30; however, it is placed on the opposite side of the frame 12 adjacent leg 17. One end of the bell crank 55 is connected to link 22 by pivot pin 58. The other end of the bell crank 55 is connected to a clevis 50 by pivot pin 57. The transfer bell crank 55 also operates within the channel portion of upper crosshead 14 and is positioned downwardly whereas power bell crank 30 faces in an upward direction. The clevis 45 (FIGS. 2 and 3) is provided with a threaded bore having lefthand threads. The clevis 50 is also provided with a threaded bore; however, the threads are right-hand threads.

A connecting rod 40 has one end thereof provided with left-hand threads 41 and the other end thereof provided with right-hand threads 42. The threads 41 of connecting rod 40 engage the threaded bore of clevis 45, and the right-hand threads 42 engage the threaded bore of clevis 50. Rotation of the connector rod 40 either shortens or lengthens the distance between the clevises 45 and 50 depending on the direction of rotation. A lock nut 51 is threaded on the threads 42. The lock nut 51 is tightened against the clevis 50 to prevent rotation of connector rod 40 when a proper adjustment has been made.

*Operation*

The power cylinder 37 may be operated by manually controlled hydraulic valve means (not shown specifically) or be controlled by a hydraulic valve which is electrically controlled by solenoids (not shown specifically). This structure may be included in the power pack 70 which also includes the hydraulic pump. It is assumed that the proper valve mechanism is present, and one desires to extend the clamping bar 20 (moving downwardly) into engagement with the work piece which would be paper. The valve is shifted to the appropriate position and the power cylinder 37 will draw actuator rod 36 into the cylinder. This will cause power bell crank 30 to rock about pivot pin 31 in a counterclockwise direction. Pivot pin 32 connected to link 26 moves downwardly. The pivot pin 33 will move upwardly and carry connector rod 40 to which it is secured with it. This will cause transfer bell crank 55 to rotate in a clockwise direction about pin 56. The pivot pin 58 connected to link 22 will move downwardly. With the pivot pins 32 and 58 moving downwardly the links 26 and 22 also move downwardly carrying with them the clamping bar 20. The clamping bar may be guided in its vertical movement by suitable channel-type elements or the equivalent.

When the valve is shifted in the other direction, the actuator rod 36 is moved upwardly and the power bell crank 30 and transfer bell crank 55 are moved in the opposite direction moving the links 22 and 26 upwardly and retracting the clamping bar 20 from the work piece.

When a stack of paper is cut, it is desirable for the clamping bar 20 to extend to a position where it firmly engages the stack of paper to clamp it in position under the cutting mechanism. This is possible only if the clamping bar is level.

The position of the clamping bar 20 over the table is determined by the position of clevis 35 on the actuator rod 36. The clamping bar is positioned at a height so that the bottom thereof extends below the knife for safety measures.

Leveling of the clamping bar 20 is accomplished by adjusting the rod 40. Due to the reverse direction of threads 41 and 42, rotation of the rod will either increase or decrease the distance between the bell cranks, depending on the direction of rotation. The position of bell crank 30 is fixed due to its connection with the hydraulic cylinder actuator rod 36. Therefore, when rod 40 is rotated so as to increase the distance between the bell cranks, bell crank 55 will rotate in a counterclockwise direction and raise clamping bar link 22, while bell crank 30 remains stationary since rod 36 does not move, and thus link 26 does not move with adjustment of connecting rod 40. This will raise the right side of clamping bar 20 as viewed in FIG. 1. The converse is true when the rod is rotated so as to decrease the distance between the bell cranks.

From the above description it can be seen that the power means for the clamping mechanism is located below the paper cutting table. This provides an arrangement wherein leakage of a hydraulic system cannot damage paper positioned on the paper cutting table. The bell crank arrangement utilized to reciprocate the clamping bar is of a simple design and is therefore economical to manufacture and maintain. The adjustable connecting rod between the bell cranks provides means for quickly and accurately positioning the clamping bar with respect to the paper cutting table. With the bell cranks and connecting rod located below the paper cutting table it is easily accessible for adjusting.

While a preferred embodiment of this invention has been described, it will be understood that modifications and improvements may be made thereto. Such of these modifications and improvements as incorporate the principles of this invention are to be considered as included in the hereinafter appended claims unless these claims by their language expressly state otherwise.

I claim:

1. Clamping structure for a paper cutting machine comprising: a supporting frame; a clamping bar associated with said frame and movable with respect thereto; first and second links pivotally connected to opposite ends of said clamping bar; first and second bell cranks pivotally mounted to said frame; reciprocating power motor means operably mounted between said frame and said first bell crank; said first link being pivotally attached to one end of said first bell crank; said second link being pivotally attached to one end of said second bell crank; and a rod connected between the ends of said bell cranks opposite to which the links are connected; and means for adjusting the length of said rod to cause movement of said second link with respect to said first link as said length is varied, whereby the height of the respective ends of said clamping bar may be relatively adjusted.

2. Clamping structure for a paper cutting machine comprising: a supporting frame; a clamping bar associated with said frame and movable with respect thereto; first and second links pivotally connected to opposite ends of said clamping bar; first and second bell cranks pivotally mounted to said frame; said first link being pivotally attached to one end of said first bell crank; said second link being pivotally attached to one end of

said second bell crank; a rod connected between the ends of said bell cranks opposite to which the links are connected; and means for adjusting the length of said rod to cause movement of said second link with respect to said first link as said length is varied, whereby the height of the respective ends of said clamping bar may be relatively adjusted; a motor means operably mounted to said frame and having an actuator rod connected to said first bell crank; said actuator rod being of variable length and adjustable, and adapted to cause like movement of both of said links whereby the over-all height of said clamping bar may be adjusted.




References Cited in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,209,705 | Hayward | Dec. 26, 1916 |
| 1,756,527 | Thompson | Apr. 29, 1930 |
| 2,446,823 | Grant | Aug. 10, 1948 |
| 2,506,436 | Seybold | May 2, 1950 |
| 2,570,873 | Seybold | Oct. 9, 1951 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 803,064 | Germany | Jan. 10, 1950 |