May 14, 1963 J. RICHTER ETAL 3,089,162

AUTOMATIC SHOE LAST OPERATING DEVICE

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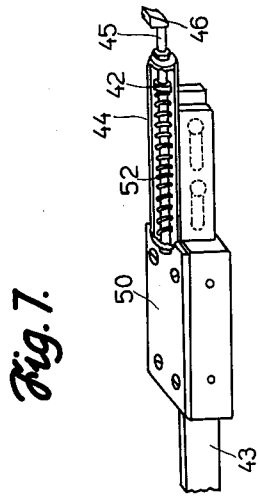


Fig. 7.

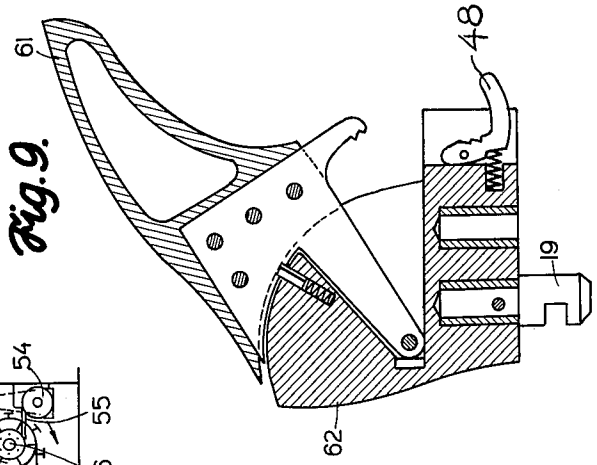


Fig. 9.

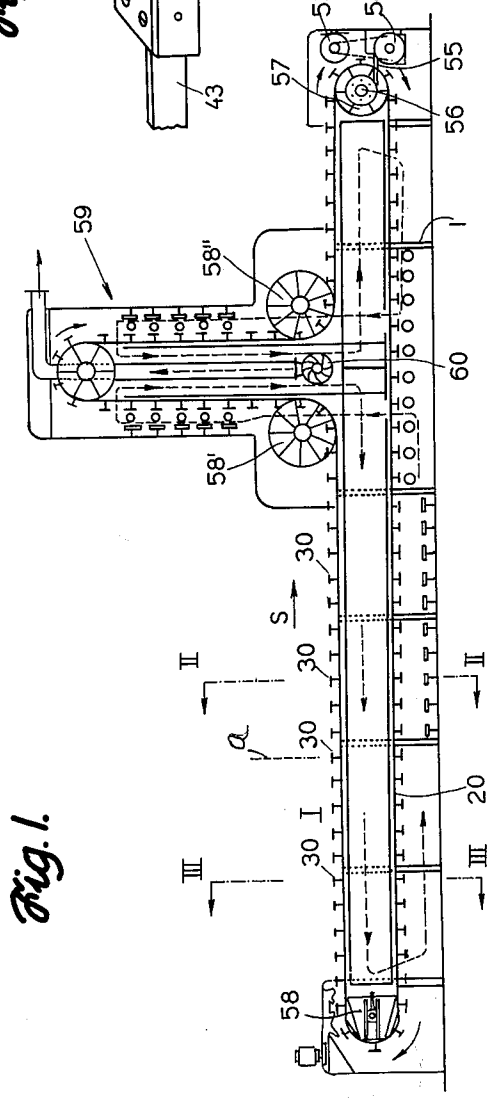


Fig. 1.

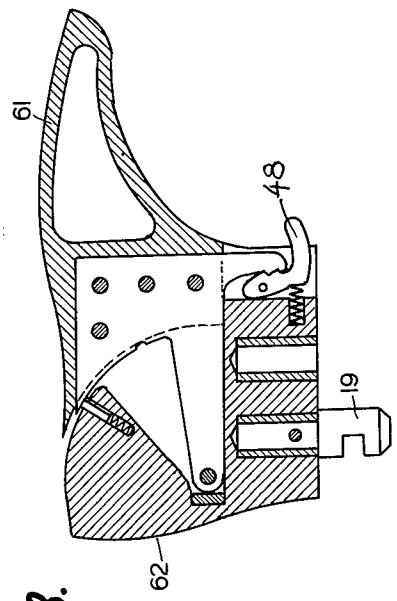


Fig. 8.

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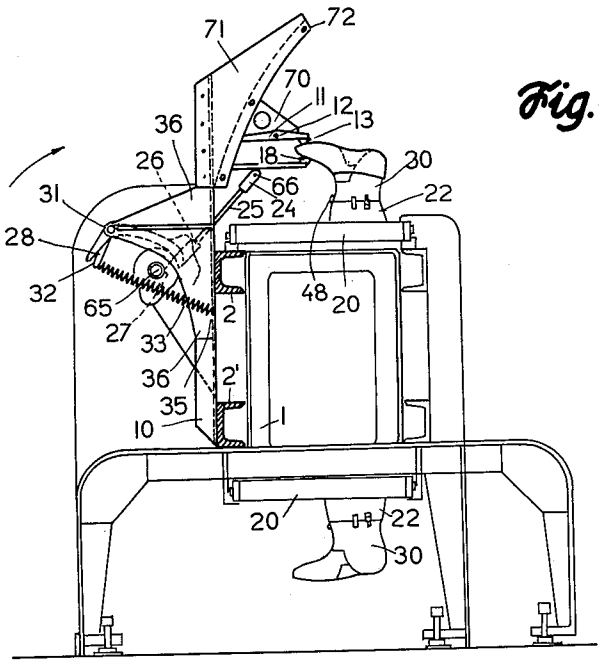


Fig. 2.

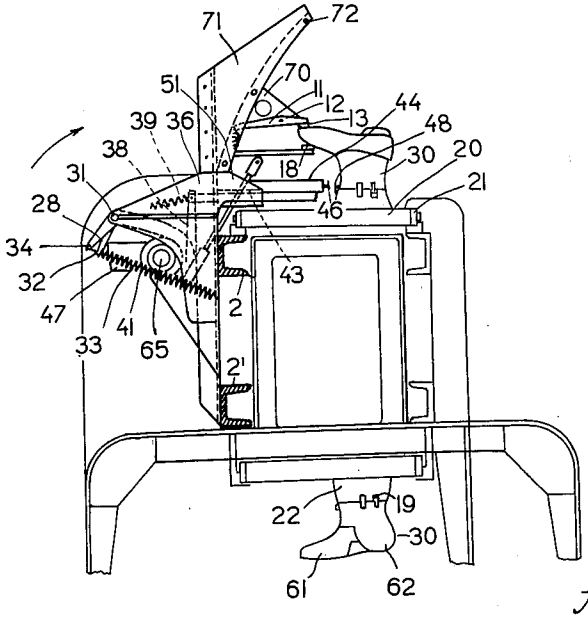


Fig. 3.

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Fig. 4.

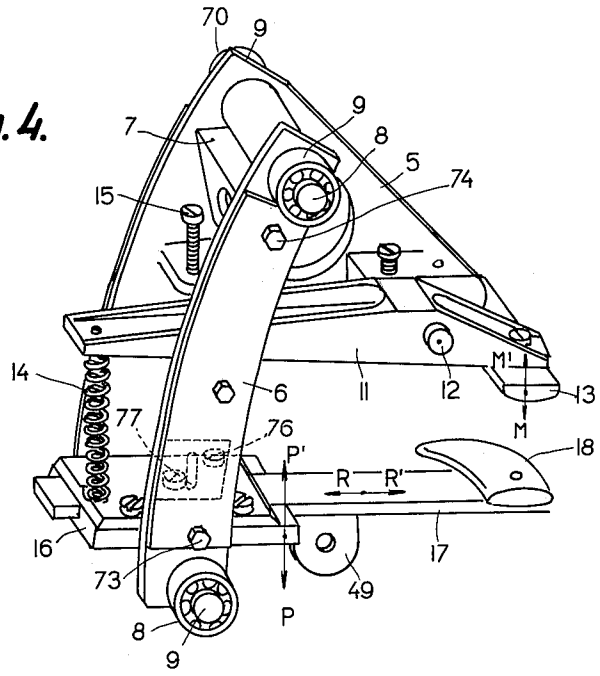


Fig. 5.

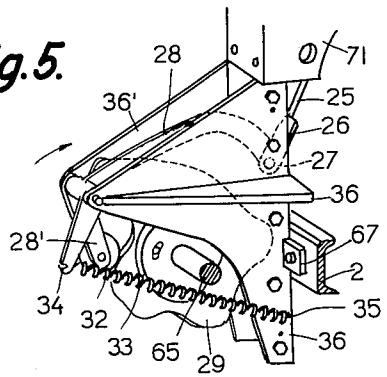
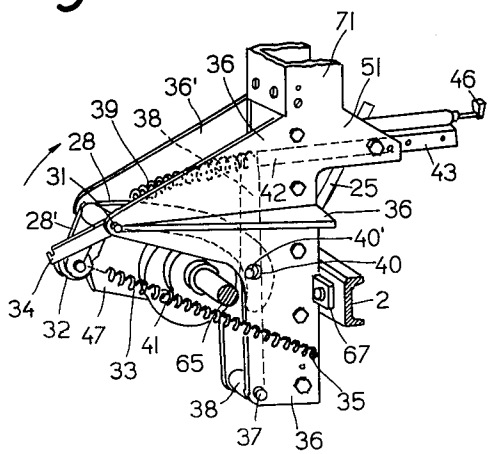


Fig. 6.



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United States Patent Office 3,089,162 Patented May 14, 1963

3,089,162

AUTOMATIC SHOE LAST OPERATING DEVICE

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Claims priority, application Czechoslovakia Dec. 29, 1960
8 Claims. (Cl. 12—1)

This invention relates to the automatic manufacture of shoes and shoe components, and more specifically to a device for automatically operating shoe lasts in the lasting operation and like manufacturing steps.

The manufacture of such mass produced shoes as fabric shoes with vulcanized soles has been mechanized or automatized to a substantial extent, but the lasting of vamps and the loosening of the vamps when lasting is completed are still largely performed by hand.

The object of this invention is the provision of automatized equipment for shaping a vamp or shoe upper by means of a last.

A more specific object is the provision of machinery for automatically stretching or closing the last with the vamp pulled over it, and to collapse or open the stretched last after completion of the lasting operation preparatory to removal of the vamp therefrom.

A further object is the provision of automatic last operating equipment which is part of a conveyorized manufacturing arrangement.

With these and other objects in view, this invention essentially resides in a last operating mechanism mounted on a support, a conveyor for conveying a last toward and away from a position adjacent the last actuating mechanism, and drive means for actuating movement of the mechanism and of the conveyor in timed sequence. The last operating mechanism includes a carriage member which is movable on the support in a predetermined path and carries two jaws for engagement with a last carried by the conveyor.

Other features and the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures thereof, and wherein:

FIG. 1 illustrates a conveyor suitable for cooperation with the last operating mechanism of the invention, the view being in side elevation;

FIG. 2 shows the conveyor of FIG. 1 in front elevational section substantially on the line II—II on an enlarged scale together with a preferred embodiment of a last operating mechanism;

FIG. 3 shows the conveyor of FIG. 1 in front elevational section substantially on the line III—III and on the scale of FIG. 2, together with another embodiment of the last operating mechanism of the invention;

FIG. 4 shows a detail common to the devices of FIGS. 2 and 3 in a further enlarged perspective view;

FIG. 5 is an enlarged perspective view of portions of the apparatus of FIG. 2;

FIG. 6 illustrates elements of the apparatus of FIG. 3 in a view corresponding to FIG. 5;

FIG. 7 shows a detail of the apparatus of FIG. 6 in an enlarged perspective view; and

FIGS. 8 and 9 show two last-forming parts in different positions with respect to each other.

Referring now to the drawing in detail, and initially to FIG. 1, there is seen a conveyor mainly consisting of a frame 1, a belt composed of hingedly connecting links 20, and a drive mechanism consisting of an electric motor 53

and a transmission 54 which transforms the constant rotary movement of the motor 53 into indexing movement by means of a Geneva wheel arrangement or the like. The output shaft 55 of the transmission 54 is geared to the shaft 56 of a drive pulley 57 over which the belt of conveyor links 20 is trained in driving engagement. The belt passes in a closed loop over a plurality of idler pulleys 58, 58', 58'' which support the belt and change its direction of movement in a manner well known in itself. Between the idler pulleys 58 and 58' the conveyor belt travels in a substantially horizontal path in the direction of the arrow S.

The last operating devices with which the present invention is more specifically concerned are arranged adjacent the conveyor belt portion intermediate the pulleys 58 and 58'. Each belt link 20 carries a last 30, not shown in detail because of the small scale of FIG. 1, from the horizontal conveyor path into an oven 59 which is equipped with a fan 60 for forced circulation and exhaust of gases which travel in the oven as indicated by arrows. After oven treatment, the lasts 30 are returned to the aforementioned horizontal conveyor section.

Last operating devices of the invention are arranged along the horizontal conveyor section at two stations respectively located after and ahead of a loading and unloading station generally indicated by reference character *a*.

The last operating station closes a last 30 which is conveyed to the station by the indexing conveyor. It is illustrated in more detail in FIGS. 2 and 5. The device installed ahead of the station *a* opens the last. This device is shown in FIGS. 3, 6, and 7. FIG. 4 shows an element common to both devices which also have other features in common.

The last which cooperates with the opening and closing devices of the invention is of the type in which a toe portion 61 is hingedly connected to a counter portion 62 of the last so that the last portions may be moved relative to each other between a closed position in which the last conforms to the shape of the shoe to be produced, and an open position in which the toe portion is deflected to facilitate the pulling of a vamp over the last, and the removal of the lasted vamp. A latch 48 snaps into place when the last 30 is moved from its open to the closed position, and opening of the last is impossible until the latch is displaced. A portion of the latch projects outward of the part of the last which is free of the vamp during the lasting operation, and the latch may be released by depressing the projecting portion. In the closed last position, the latch is wedged firmly between the last portions and very strong pressure on the projecting latch portion would be required to release the latch. It is therefore preferred to move the toe portion 61 on the counter portion 62 from the closed position a short distance in the direction away from the open position whereby the wedging is released and the latch may be moved inwardly of the last to release the latter.

The features common to the last closing device and the last opening device will first be discussed with reference to FIGS. 2 to 6. At each of the work stations, the conveyor frame 1 carries an upright column 10 connecting an upper channel 2 and a lower channel 2' which are horizontal elements of the conveyor frame 1. A top flange of the upper channel 2 carries a track 3 on which the conveyor links 20 travel on rollers 21.

A bracket 36 is mounted on each column 10 at the approximate level of the track 3, and a portion 36' of the bracket extends horizontally away from the conveyor track. The bracket is secured on the upper channel 2 of the conveyor frame by means of clamps 67 (FIGS. 5, 6). A guide member of U-shaped cross section 71 is fastened

to each column 10 above the bracket 36. It forms an arcuate guide track 72 on which a carriage 70 travels.

The carriage 70 is seen best in FIG. 4. Its frame consists of a frame member 5 which is the right side member when viewed from the conveyor, and a left side member 6 which are connected by cross members 7 and 16 fastened by screws 73, 74. The four corners of the carriage frame carry respective ball bearing rollers 9 on pins 8 for travel on the guide track 72. The cross member 16 is plate shaped, and an arm 17 projects therefrom toward the space above the conveyor links 20. One end of the arm 17 is slidably mounted on the cross member 16 so that the arm may be adjusted in the direction of the arrows R, R' when the screws 76 are loosened. The screws normally hold the arm 17 in fixed position relative to the cross member 16.

The latter is pivotable on the screws 73 when these screws are loosened, and the angular position of the cross member 16 relative to the side members 5, 6 may then be adjusted by rotating a screw 76 which is accessible through a recess 77 in the right side member 5.

The free end of the arm 17 carries an abutment member 18 the position of which relative to the conveyor frame is changed when the positions of the cross member 16 and of the arm 17 are adjusted. The path traveled by the abutment member 18 during movement of the carriage along the guide rails 72 may thus be adjusted to the requirements of differently dimensioned lasts as will presently become apparent.

A portion of the side member 5 which projects from the guide track 72 toward the conveyor track carries a pin 12 parallel to the direction of conveyor movement. A lever 11 is pivoted on the pin 12. Its shorter arm carries a pad 13 spacedly opposite the abutment member 18. During pivoting movement of the lever 11 on the pin 12, the pad 13 moves arcuately toward and away from the member 18 in the direction of the arrows M, M'. The free end of the long arm of the lever 11 spaced from the cross member 16 by a strong compression spring 14 which tends to pivot the lever 11 in the direction of the arrow M. Movement of the lever 11 in this direction is limited by a stop 15 which is threadedly adjustable on the right side member 5.

Movement of the carriage 70 on the guide track 72 is actuated by a mechanism which engages an apertured lug 49 at the underside of the arm 17. The pad 13, the abutment member 18, and the elements supporting them constitute a jaw clamp which is displaced transversely of the conveyor belt when the carriage 70 travels on the racks 72.

Reciprocating movement of the carriage is actuated by a shaft 65 which extends along the upper conveyor frame channel 2 and is connected to the output shaft of the electric motor 53 in a manner not further illustrated for continuous rotation while the motor is energized. Portions of the shaft 65 are seen in section in FIGS. 5 and 6 which respectively illustrate details of the drive mechanism of the last closing and opening devices.

The shaft 65 carries drive cams 29 and 47 in the respective devices. The drive cams each engage a cam follower roller 32 rotatably mounted on the short arm 28' of a bellcrank lever 28. The lever 28 is pivoted on a pin 31 on the bracket portion 36'. The longer arm of the lever 28 is hingedly fastened to one end of a rod 25, the other end of which is attached to the apertured lug 49 on the carriage 70 by a pivot pin 66 (FIG. 2). The pin passes through a sleeve 24 which threadedly engages the rod 25 and is longitudinally adjustable thereon. A similar sleeve 26 is interposed between the other end of the rod and the pin 27 which fastens it to the lever 28.

The cam follower roller 32 is held in engagement with the respective drive cam 29 or 47 by a spring 33 one end of which is fastened to an arm 34 fixedly attached to the bellcrank lever 28, whereas the other end is hooked over a lug 35 on the bracket 36.

The cams 29 and 47 are shaped and arranged on the shaft 65 in such a manner that they actuate movement of the respective carriages 70 on their tracks 72 while the conveyor stands still. Because of the different contour of the cams 29 and 47 the movements of the carriages 70 are different, but their mode of actuation by the motor 53 is the same, and will be evident to those skilled in the art without further description.

In addition to the elements common to both devices and described above, the last opening device is equipped with means for depressing or releasing the latch 48 of a last 30, and the latch releasing mechanism will now be described with reference to FIGS. 3, 6 and 7 of the drawing.

The shaft 65 carries a cam 41 adjacent the drive cam 47. The cam 41 cooperates with a cam follower roller 40 rotatable on a pin 40'. The pin is attached to an arm 38 which is pivoted to the bracket 36 on a pin 37. The arm is biased by a spring 39 into engagement of the cam follower 40 with the cam 41. The free end of the arm 38 abuts against a slide 43 which is held in a support 50 fixedly fastened to a projection 51. The projection extends from the bracket 36 toward the conveyor track.

As best seen in FIG. 7, a tubular housing 44 is fastened to the slide 43. A rod 45 is longitudinally slidable into and out of the housing 44 and biased outward by a spring 52. A collar 42 on the rod 45 limits its outward movement. The free end of the rod 45 outside the housing 44 carries a presser foot 46 which is wedge shaped and has a free transverse face obliquely inclined relative to the direction of elongation and movement of the rod 45.

The aforedescribed last operating devices function as follows in cooperation with the conveyor shown in FIG. 1:

A fabric vamp with its bottom or innersole portion sewn in place is pulled at the loading station *a* over one of the lasts 30 which may be removed from the conveyor for this purpose, or the vamp is attached to the last while the latter is fastened to a last carrier 22 fixedly fastened to each link 20 as best seen in FIGS. 2 and 3. A bayonet type closure 19 connects the last to the carrier. During the loading operation, the last 30 is open so that the overall length of its foot portion is reduced, and placing the vamp over the last is facilitated.

An indexing step of the conveyor brings the last 30 with the vamp pulled over it into a position of operative alignment with the last closing device shown in FIG. 2. The drive cam 29 is synchronized with the conveyor movement in such a manner that the carriage 70 is at the top of its path when the jaw clamp between the pad 13 and the abutment member 18 is aligned with the conveyor to receive the upwardly bent toe portion 61 of the open last 30.

When the indexing step of the conveyor is completed, the carriage 70 holding the toe portion 61 in its jaws moves downward on the tracks 72 toward the position shown in FIG. 2. The cam 29 is shaped in such a manner that the carriage 70 moves up and down four times while the conveyor is stopped, thereby substantially duplicating the usual hand lasting operation in which the last is alternatingly closed and opened, each closing stroke being slightly longer than the preceding one to stretch the vamp and properly position it on the last.

The fourth downward stroke of the carriage 70 is long enough to permit the latch 48 to drop into its locking position under the urging of a spring, by gravity, or otherwise. The vamp is now lasted and may undergo other operations as the last 30 is carried by the conveyor past other working stations and through the oven 59 to the last opening station ahead of the unloading and loading station *a*. In the meantime, additional vamps mounted on respective lasts 30 are lasted sequentially and automatically.

The closed last 30 with the partly completed shoe on it is brought into alignment with the last opening device as shown in FIG. 6, the projecting latch 48 being aligned

with the presser foot **46**. The carriage **70** is spacedly adjacent the bottom end of the tracks **72**. Rotation of the shaft **65** first causes the carriage **70** to move downward from the position seen in FIG. 6 a small distance sufficient to release the latch **48** from the wedging engagement with the last portions. The rod **45** is then advanced toward the last **30** by the cam **41** until its presser foot **46** engages the latch **48** and releases the toe portion **61** from the counter portion **62**. The toe portion is immediately deflected from the closed position by the resilience of the vamp or by a suitably arranged spring. The last **30** may now proceed on the conveyor to the unloading station for removal of the partly completed shoe from the last.

The equipment described thus performs the lasting operation entirely automatically. The vamp need not be touched by human hands from the moment it is pulled over the open last until it is pulled from the again opened last.

While the cooperation of the last closing and opening devices of the invention with a hinged last has been described above, it will be apparent to the workers in the art that the last portions may be connected for relative movement in any other manner without departing from the spirit of the invention.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically disclosed.

What is claimed is:

1. In a conveyorized shoe making apparatus, in combination,

(*a*) a support;

(*b*) a last operating mechanism including a carriage member movable on said support in a predetermined path; and two jaw means mounted on said carriage member spacedly opposite each other;

(*c*) conveyor means movable for conveying a last toward and away from a position adjacent said last operating mechanism in which said last is engaged by said jaw means; and

(*d*) drive means for actuating movement of said carriage member on said support and movement of said conveyor means in timed sequence.

2. In an apparatus as set forth in claim 1, a second last operating mechanism mounted on said support adjacent said conveyor means for operating said last when moved away from said first mentioned mechanism by said conveyor means, said second mechanism including another carriage member movable on said support in a second predetermined path; two additional jaw means mounted on said other carriage member spacedly opposite each other; and motion transmitting means connecting said second mechanism with said drive means for timed actuation of the movement of said other carriage member.

3. In an apparatus as set forth in claim 2, a latch releasing member mounted on said support adjacent said additional jaw means for reciprocating movement, said motion transmitting means connecting said releasing member to said drive means for timed actuation of said reciprocating movement by said drive means.

4. In an apparatus as set forth in claim 1, a latch releasing member mounted on said support adjacent said jaw means for reciprocating movement, said drive means being connected to said releasing member for actuating said reciprocating movement thereof in timed sequence with the movements of said carriage member and of said conveyor means.

5. In an apparatus as set forth in claim 1, said drive means including a continuously rotating shaft, cam means on said shaft, and cam follower means cooperating with said cam means and connected to said carriage member for actuating movement of the same in said predetermined path.

6. In an apparatus as set forth in claim 1, guide rail means on said suport and wheel means on said carriage member engaging said guide rail means for guiding said carriage member in said predetermined path.

7. In an apparatus as set forth in claim 1, one of said jaw means being movable on said carriage member toward and away from the other one of said jaw means, said last operating mechanism further including resilient means permanently urging said one jaw member to move away from said other jaw member, and stop means on said carriage member for limiting the movement of said one jaw member under the urging of said resilient means.

8. In an apparatus as set forth in claim 1, said last operating mechanism including means for adjusting the position of said one of said jaw means relative to said carriage member and for fixing the adjusted position.

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