Oct. 26, 1937. E. S. FLARSHEIM 2,097,402

CLAMP

Filed Dec. 6, 1933 2 Sheets-Sheet 1

Fig. 1.

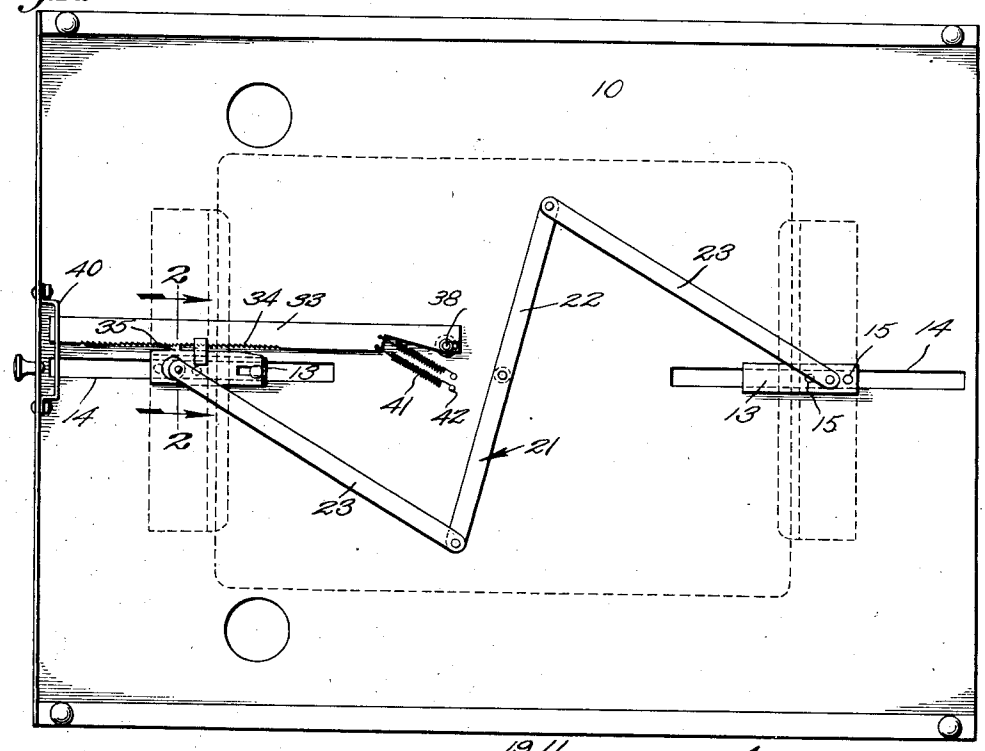


Fig. 2.

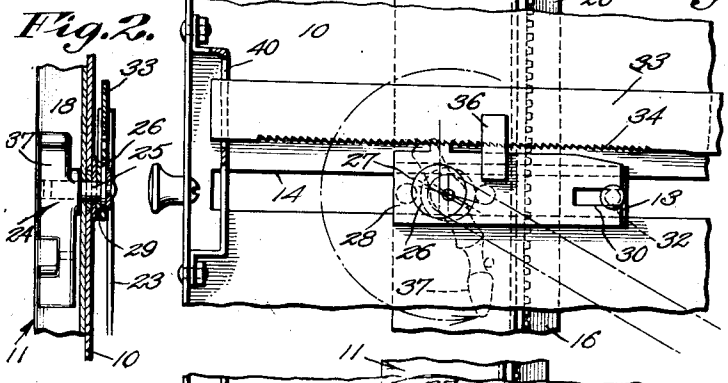


Fig. 4.

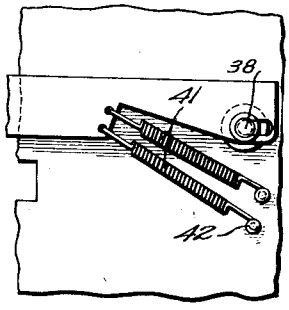
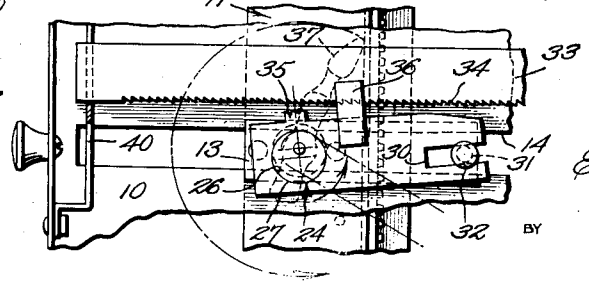


Fig. 3.



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Oct. 26, 1937. E. S. FLARSHEIM 2,097,402

CLAMP

Filed Dec. 6, 1933 2 Sheets-Sheet 2

Fig.5.

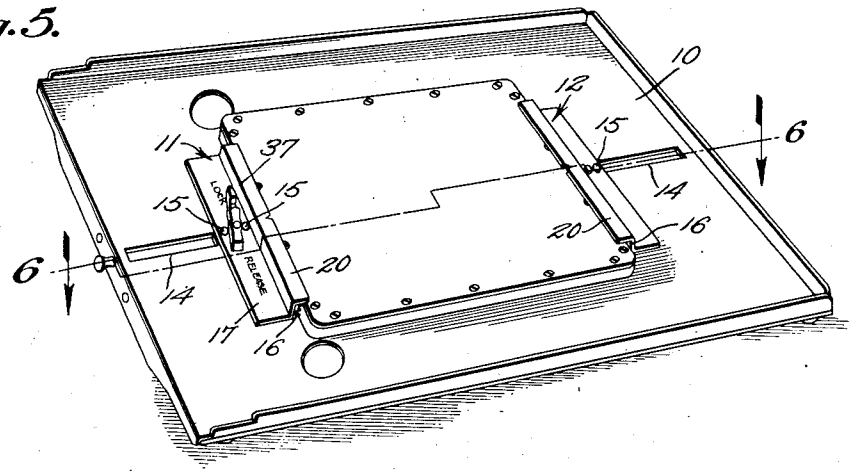


Fig.6.



Fig.7.

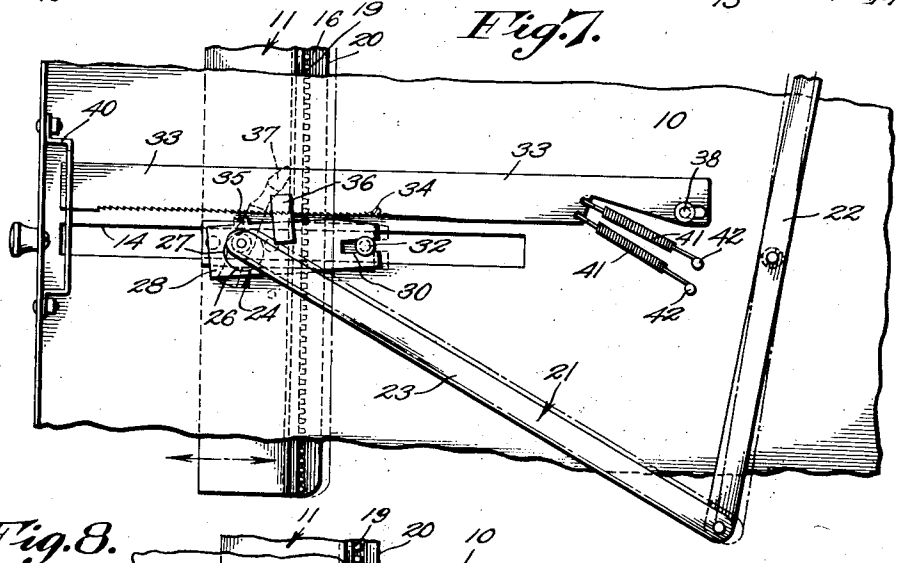
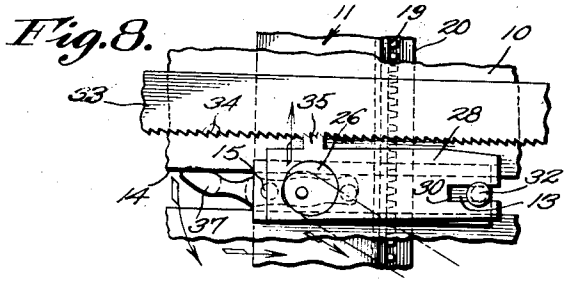


Fig.8.



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Patented Oct. 26, 1937

2,097,402

UNITED STATES PATENT OFFICE

2,097,402

CLAMP

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Application December 6, 1933, Serial No. 701,169

10 Claims. (Cl. 250—34)

This invention relates to improvements in clamps.

It is the object of this invention to provide a clamp including an actuating device which moves with one of the clamping jaws and is effective for imparting efficient clamping pressures at any point in the range of movement of the jaw, utilizing for this purpose a mechanism causing immediate automatic anchorage of the jaw and a clamping action by the movement of a single lever which in its final position effectively locks the clamp against displacement.

The invention has particular application to a clamp of that nature which has considerable range of jaw movement because of wide variation in the size of the articles clamped and in which it is desirable to center the article, as for instance, on a tray. In clamps of this type it is desirable that the jaws be co-related whereby they can be quickly brought together and centered on the article and a clamping pressure exerted thereon which rigidly fixes the article in position, the clamping device being readily active at any position of the jaws in their range.

It is, therefore, another object of this invention to provide a quick acting jaw clamp in which the jaws can be rapidly drawn together and centered on the article by grasping one jaw and moving it toward the article and in which a clamping pressure can be exerted on the jaws in any position as drawn against the article, the clamping medium having immediately effective action at any position.

It is a further object to provide a speed clamp device effective at a number of jaw positions, which device applies a spring urged clamping pressure on the article.

Other objects and certain advantages will be more fully apparent from a description of the accompanying drawings, in which:

Figure 1 is a bottom view of a tray incorporating the improved clamping mechanism of this invention.

Figure 2 is a fragmentary sectional view taken on line 2—2, Figure 1, illustrating the rotative mounting of the clamp and lock operating lever.

Figure 3 is a fragmentary view looking toward the under side of the tray and showing an enlarged view of the clamp and lock mechanism in released position.

Figure 4 is an enlarged fragmentary view taken similar to Figure 3, but showing the locking mechanism in effective operative position.

Figure 5 is a perspective view looking at the top of the tray and illustrating a plate holder fastened in position on the tray by means of the clamp.

Figure 6 is a sectional view taken on line 6—6, Figure 5.

Figure 7 is a fragmentary view taken similar to Figure 4, illustrating the coupling linkage extending between the opposing clamp elements in release position, in full lines and in clamping position in dot and dash lines.

Figure 8 is a fragmentary view taken similar to Figures 3, 4, and 7, but illustrating the clamp locking mechanism just prior to the final tightening phase of its movement, the arrows indicating the direction of the forces being exerted to set the lock plate and bring the jaws together.

The clamp herein concerned is shown in use for fixing a plate holder in position on the tray of an X-ray apparatus. It will be obvious that the clamp itself contains the inventive subject matter of this application, and is therefore applicable to a multiplicity of general uses.

The clamp generally regarded includes a pair of jaws, an operating connection between the jaws, a combined locking and clamping setting device and a lever for the last mentioned device. The lever operates the locking and setting device so as to impart a clamp anchoring movement in the first phase of movement and a clamping action in the final phase concurrently with the locking of the clamp.

The tray used as a base mounting for the clamp in this instance is indicated at 10. The clamping jaws are indicated at 11 and 12 respectively. These jaws lie crosswise on the plate or tray and are adapted for movement longitudinally of the tray toward and from each other. The mounting for the jaws consists of guide plates 13 having grooved edges. The plates are disposed longitudinally of and within slots 14 of the tray.

The jaws are fixed to the guide plates by means of rivets 15. The associated grooved edges of the guide plates and the jaws themselves provide guide channels 16 engaging the margins of the tray along the edges of the slots. Each clamp jaw as disclosed is formed of sheet plate of double angular construction, and provides one flange 17 lying flat against the tray, an upstanding flange portion 18 carrying a rubber clamping pad 19 with a studded contact surface on its inner face, and an overhanging flange 20.

The jaws are operatively connected through a lazy tong movement 21. The lazy tong movement incorporates a centrally pivoted beam or lever 22 mounted on a pivot disposed centrally of the tray and in line with the slots of the

tray. Links 23 pivotally connect the ends of this lever or beam to the clamp jaws 11, 12. This lazy tong movement is mounted on the bottom of the tray.

If one of the jaws is moved toward the object to be clamped the other moves likewise through the lazy tong connection. In centering the object to be secured such as a plate holder, the jaws are first manually moved up against the sides of the plate.

For applying the clamping pressure, an eccentric 24 is used in the connection of the lazy tong to one of the clamping jaws. The eccentric element proper consists of a stud 25 carrying a disc 26 eccentric thereto. The stud is mounted for rotation on a fixed axis in the jaw 11 and the disc 26 is disposed in a circular recess 27 of a ratchet device or clamp and lock plate 28. This clamp and lock plate is slidably disposed along the bottom face of the guide of the clamping jaw. It is spaced from the guide by means of a washer 29 about the stud at one end and is guided and spaced at the other end by the engagement of a slot 30 thereof in an annular groove 31 of a stud 32 fixed in the guide. This mounting permits longitudinal and swinging movement of the clamp and lock plate 28. It will be noted that the stud 25 is the pivotal connection for the link 23 of the lazy tong, the link lying against the bottom of the ratchet plate 28.

In the present invention the eccentric means has been provided carried by one jaw for transmitting the movement of the eccentric to the jaws at any position in the wide range of movement of the jaws relative to the support. Accordingly, it has been arranged that the eccentric is effective for moving the ratchet or clamp and lock plate into anchored position or a position of footing on the tray or support where the eccentric can impart clamping movement to the jaws. For this purpose the anchorage cooperating with the clamp and lock bar is in the form of a long toothed bar 33 extended along the range of movement of the clamp device. This bar provides saw teeth 34 along its inner edge, in other words, along and parallel to the path of movement of the clamp lock plate. The clamp and lock plate includes a lateral extension 35 on its edge adjacent the toothed bar having saw teeth cooperating with the teeth of the bar.

The clamp and lock bar is maintained in the same plane with the toothed bar or anchorage for perfect registration of the teeth by means of guide arms 36 which extend from each side of the clamp and lock plate and straddle the toothed bar. Now it will be observed that the clamp and lock plate may have a longitudinal and swinging movement relative to the toothed bar. This movement is imparted by the eccentric in the following manner:

As shown in Figure 3, the eccentric operating lever 37 is in off position. As the operator swings the lever the eccentric disc is effective for imparting a swinging action to the clamp and lock plate, moving it toward the toothed bar. At this time or during this phase of movement the axis of rotation of the eccentric stud is stationary and accordingly no movement of the clamp jaws ensues. This phase of movement may be described as the anchoring movement of the clamp setting and locking means.

The teeth of the clamp and lock bar engage the teeth of the anchor bar. At this time, as shown in Figure 8, the eccentric disc continues to crowd the clamp and lock plate against the toothed bar due to the swinging or revolving of the center of the disc about the axis of the stud. To compensate for this, it is provided that the toothed bar will yield laterally. Accordingly, it is pivotally attached to the tray at its inner end on a pivot stud 38 and is guidingly mounted at its outer end in a guide slot 39 of a clip 40.

A pair of springs 41 are provided under tension between fixed studs 42 on the tray and the inner side of the toothed bar, these springs tending to pull the toothed bar against the clamp and lock plate and to resist the enforced outward movement of the toothed bar. In normal position when the clamp and lock plate is not engaging the toothed bar, the bar rests against the abutment afforded by the side of the slot 39 (see Figure 3). At the same time the springs are effective for urging the toothed bar longitudinally toward the object being clamped for a purpose hereinafter described.

With the rotative movement of the lever about half completed, the clamp and lock plate becomes securely anchored having been swung its maximum distance against the toothed bar or anchorage for a secure attachment therewith. Now it will be observed that further movements of the lever 37 result in translation of the clamp jaws toward each other by imparting a lineal motion to the guide plate 13 of the jaw directly through the axis of the stud as to one clamp jaw and imparting an opposite movement to the other jaw through the lazy tong directly through the movement of the stud. Since the clamp and lock plate has been anchored, the important result is to cause the stud to move longitudinally of the slot and carry the guide and jaw therewith.

The described action of the eccentric in moving the guide and clamps however is off-set by engagement of the jaws with the article being clamped. The clamps engage the article under the lineal force imparted to the guide through the longitudinal moving stud, but upon engagement with the article the jaw is stopped against movement and the movement is then directed through the clamp and lock plate into the toothed anchorage bar 33 which moves longitudinally away from the work, this being possible due to the fact that the pivoted end incorporates a slotted connection 38 on the pivot stud.

With movement of the jaws blocked and longitudinal outward movement of the toothed anchorage bar taking place, the force of the springs 41 of the anchor is imparted against the sides of the article through the toothed bar, clamp and lock plate, the disc of the eccentric, the stud of the eccentric, the clamp guide and clamp itself. This position is illustrated in Figure 4 although the work is not shown in position.

The linkage or lazy tong movement 21, connecting the jaws of the clamp, provides for coordinated movement of both jaws toward and from the work. It also functions as a jaw sustaining means for preventing movement of one jaw away from the other, when the other jaw is fixed in position. The present improvements relating to the mechanism for moving the jaw 11 against the work may be provided with or without the lazy tong movement; that is to say it may be provided with some other form of sustaining means for the other jaw 12. In other words, any form of support may be provided for jaw 12, entirely independent of the mechanism of jaw 11.

In summary, the swinging lever causes two

phases of movement. The first phase of movement takes place on a fixed stud axis, the disc of the eccentric swinging to move the clamp and lock plate to anchor. The second phase takes place when the stud or axis of the eccentric is forced to move longitudinally by the anchorage of the clamp and lock plate. The yieldable contact of the clamp and lock plate with the anchorage bar has a further advantage in that it permits a yielding contact of the teeth so that in the event they do not mesh perfectly the teeth will not be damaged during the period when they are being forced into positive engagement. Moreover in the event that an operator should attempt to bring the clamp jaws up against the sides of the article in the initial centering and clamp locating action without releasing the clamp, the teeth of the clamp and lock bar will slip over the teeth of the anchorage bar. This however can only occur on inward movement of the jaws because of the saw tooth nature of the teeth.

Having described my invention, I claim:

1. In a clamp device, a support, a pair of jaws slidably mounted on said support, a lazy tong connection between said jaws, an anchorage bar mounted on said support along the path of travel of one jaw, an eccentric device mounted in said latter jaw, an anchoring element acted on by said eccentric device and cooperating with said anchorage bar, said eccentric active on said jaw for moving the jaws together when the anchoring element is engaged with the anchorage bar.

2. In a clamp device, a support, a pair of jaws slidably mounted on said support, a motion reversing connection between said jaws, an anchorage bar yieldably pivotally and slidably mounted on said support for lineal movement along the path of travel of one jaw and swinging movement laterally thereof, an eccentric device mounted in said jaw, an anchoring element acted on by said latter eccentric device for engagement with said anchorage bar, said eccentric active on said jaw for moving the jaws together after the anchoring element has been engaged with the anchorage bar.

3. In a device of the class described, a pair of clamping jaws, a support for said jaws permitting movement of the jaws toward and from each other, a lazy tong connection between said jaws, an eccentric element having a stud rotatably mounted in one of said jaws and providing an end connection for the lazy tong, an anchor plate pivotally and slidably mounted on said latter jaw for swinging movement laterally and lineal movement parallel to the movement of the jaws, said eccentric mounted in a circular aperture of said anchor plate, a saw toothed anchor bar pivotally and slidably mounted on a support, springs urging said bar laterally toward the anchor plate and longitudinally toward the article being clamped, said anchor plate including teeth cooperating with the teeth of the anchor bar for preventing movement of the anchor plate away from the work when engaged, and said eccentric related to the jaw and anchor plate, whereby movement of the eccentric engages the anchor plate with the anchor bar in the first phase of movement thereof and moves the jaw against the work in the second phase of movement thereof.

4. In a device of the class described, a pair of clamping jaws, a lazy tong connecting said jaws, a support for said jaws, an eccentric element having its stud rotatably mounted in one of said jaws and connecting the adjacent end of the lazy tong, an anchor plate mounted on said latter jaw, said anchor plate having the eccentric element mounted in a circular aperture thereof, a toothed anchor element, said anchor plate including teeth cooperating with the teeth of the anchor element, and said eccentric related to the jaw and anchor plate, whereby movement of the eccentric engages the anchor plate with the anchor element, moves the jaw against the work and locks the anchor plate in clamping position.

5. In a device of the class described, a pair of clamping jaws, a tray for supporting said jaws including aligned slots, each jaw including a guide engaged in a respective slot, a lazy tong connection between said jaws, an eccentric element having a stud rotatably mounted in the guide of one of said jaws and mounting the adjacent end of the lazy tong, a ratchet plate pivotally and slidably mounted on said latter guide for swinging movement laterally and lineal movement parallel to the movement of the jaws, said ratchet plate having the eccentric mounted in a circular aperture thereof, a rack bar pivotally and slidably mounted on said tray, springs urging said bar laterally toward the ratchet plate and longitudinally toward the article being clamped, and said eccentric related to said latter guide and said ratchet plate, whereby movement of the eccentric engages the ratchet plate with the rack bar and moves the jaw against the work.

6. In a device of the class described, a support element, a pair of clamping jaws slidably mounted on the support element, sustaining means for preventing movement of one jaw away from the other, a rack disposed adjacent to the second mentioned jaw, a ratchet device mounted on the second mentioned jaw, an eccentric for swinging the ratchet device into engagement with the rack and moving said ratchet device and second mentioned jaw for applying a clamping pressure against work interposed between the jaws.

7. In a device of the class described, a support plate, a pair of clamping jaws slidably mounted on said plate, sustaining means for one of said jaws for preventing movement thereof away from the other jaw, an anchorage member on the support plate extended along the path of movement of said second mentioned jaw, an eccentric journaled in said second mentioned jaw, and an anchoring element mounted on said second mentioned jaw and actuated by said eccentric for causing positive engagement of said anchoring element with said anchorage member and clamping movement of the second mentioned jaw.

8. In a device of the class described, a support plate, a pair of clamping jaws slidably mounted on said plate, sustaining means for one of said jaws for preventing movement thereof away from the other jaw, an anchorage member on the support plate extended along the path of movement of said second mentioned jaw, an eccentric journaled in said second mentioned jaw, an anchoring element mounted on said second mentioned jaw and actuated by said eccentric for causing positive engagement of said anchoring element with said anchorage member and clamping movement of the second mentioned jaw, and a spring for urging said anchorage member toward the first mentioned jaw, and toward the anchorage member.

9. In a device of the class described, a pair of clamping jaws, means for slidably supporting said jaws, sustaining means for supporting one of said jaws in fixed relationship to the other of

said jaws, a rack disposed adjacent the second mentioned jaw, a spring for urging said rack toward the work being clamped, a ratchet device mounted on the second mentioned jaw, an eccentric for swinging the ratchet into engagement with the rack and moving said rack and second mentioned jaw toward the first mentioned jaw for clamping the work between the jaws.

10. In a device of the class described, a plate, a pair of jaws slidably mounted on said plate for movement toward and from each other, an anchorage member disposed along the path of movement of one of said jaws, and a gripping device carried by said last mentioned jaw for engaging the anchorage member and fixing said jaw in position relative thereto, and sustaining means for the other jaw for preventing movement thereof away from the first jaw.

EDWIN S. FLARSHEIM.