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CLAMP OPERATING AND LOCKING MEANS

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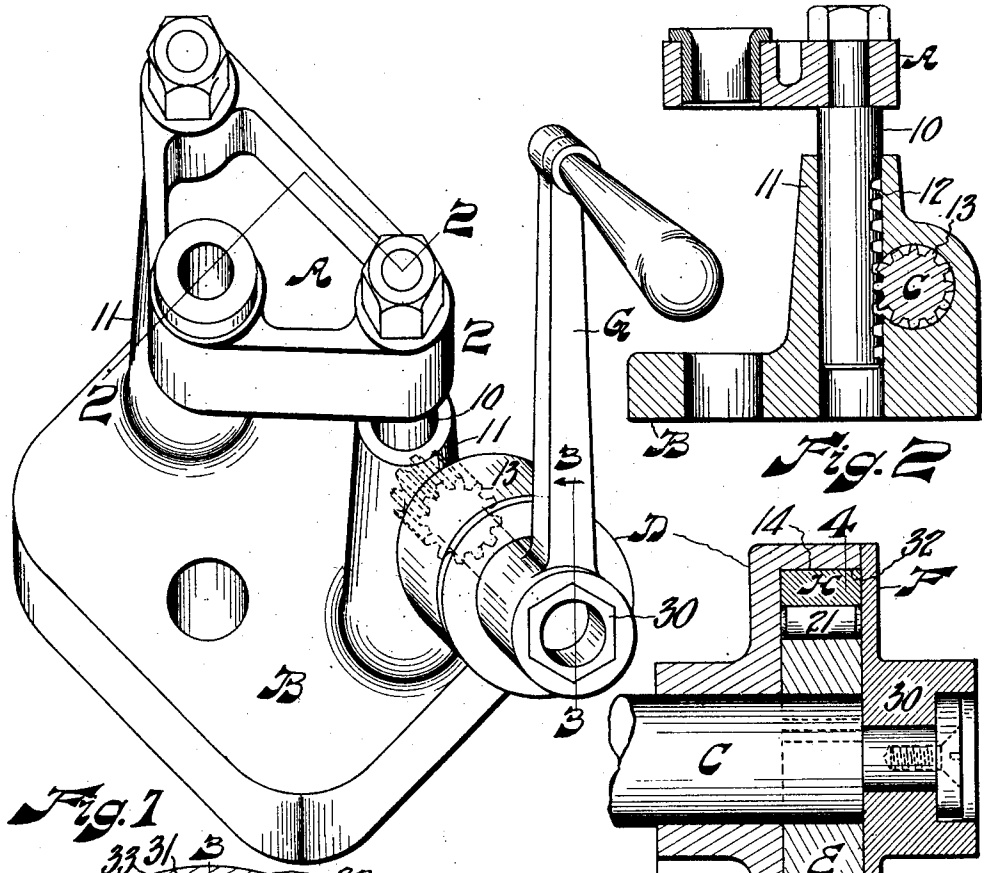


Fig. 1

Fig. 2

Fig. 3

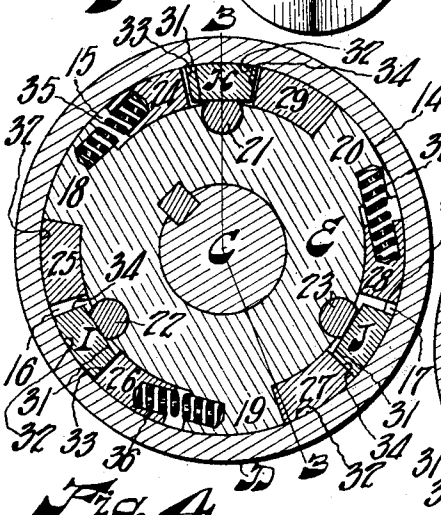


Fig. 4

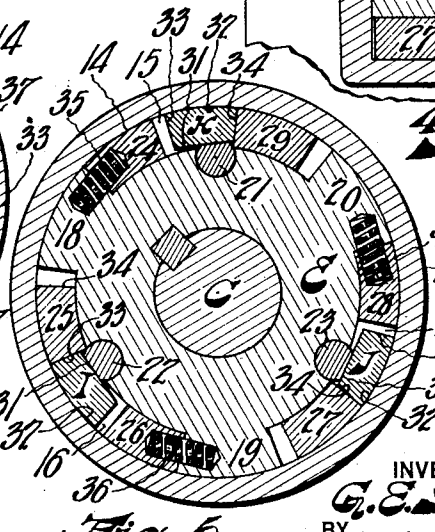


Fig. 5

INVENTOR
G. E. Swartz
BY
C. F. Heinkel
ATTORNEY

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UNITED STATES PATENT OFFICE

GUY E. SWARTZ, OF DETROIT, MICHIGAN

CLAMP OPERATING AND LOCKING MEANS

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My invention relates to means for operating and locking clamps.

Objects of my invention are: simple, easily operable and efficient structure of clamp operating and locking means; automatic locking of operating mechanisms so that clamps cannot be moved nor move independent of operation of operating mechanism, or unless operating mechanism is operated so that clamps will automatically remain in positions moved into and thereby leave both hands of operators free for other things such as loading and unloading jigs; automatic releasing of locking upon beginning of operations of operating mechanism so that clamps can be moved without friction on operating and locking members; automatic locking of operating mechanisms and consequently of clamps upon completion of clamping movements thereof so that clamps are effectively held against unclamping due to pressure brought thereon; automatic limiting of locking pressure at completion of clamping movements to prevent excessive wedging of locking members; direct driving contact from driving members to clamps to prevent driving through locking mechanisms; inclosing locking mechanisms immediately around operating shafts to protect such mechanisms against chips and the like and prevent injury to operators and eliminating all line or edge contacts to prevent production of grooves during use of devices and thereby increase the length of usefulness of such devices.

Other objects will appear in this specification, or will become apparent, or obvious, or will suggest themselves upon an inspection of this specification and the accompanying drawing.

In clamp devices, such as jigs and the like, it is quite desirable for economic production of work that operations of the parts thereof are made as automatic as possible.

In my invention, all operations of jig parts are automatically performed upon a clamping and unclamping movement of one operating member; clamps remain in whatever positions into which they may have been moved; heavy locking is produced only for holding clamps in clamping positions; and all line or edge contacts of wedging members are eliminated.

For illustration but not for limitation purposes, I have shown in the accompanying drawing one certain device embodying my invention, but I am aware that my invention can be embodied in or applied to other devices.

In the accompanying drawing mentioned:

Fig. 1 is a perspective view of one of a certain type of jigs embodying my invention.

Fig. 2 is a transverse section taken in a vertical plane indicated by the line 2—2 in Fig. 1 showing more clearly the geared relation between the clamp and the operating shaft.

Fig. 3 is a longitudinal section, on a larger scale, taken in a vertical plane indicated by the line 3—3 in Fig. 1 and in Fig. 4 showing relations of parts more clearly.

Fig. 4 is a transverse section taken in a plane indicated by the line 4—4 in Fig. 3 showing relations of parts while the operating mechanism is inactive and the two lower locking wedges in locking position and preventing rotation of the clamp operating mechanism in either direction as long as the operating mechanism is not operated by means of the handle.

Fig. 5 is a transverse section similar to Fig. 4 showing relations of parts when the driving parts on the driven and driving members are in contact, the springs between them compressed, and the locking wedges forced into locking contact to prevent an unclamping movement of the clamp.

Similar reference characters refer to similar parts throughout the views.

The clamp A has the stems 10 depending from the same and are guided and longitudinally movable in the bosses 11 on the base B and have the gear teeth 12 in rack formation along the rear sides thereof and in permanent mesh with the teeth 13 in pinion formation on the shaft C which is journaled in the base and also in the cup like casing D having the bore 14 concentric with the journal of the shaft.

The driven member E is keyed onto the shaft C, is shown as journaled in the bore 14 and has the recesses 15, 16, and 17 therein and the driving parts 18, 19, and 20 thereon.

The rockable pins 21, 22 and 23 are journaled in the driven member in such a position that the flattened sides thereof extend above the bottom of the recesses.

The driving member F is journaled on the shaft C, closes the open end of the casing D, has the prongs 24, 25, 26, 27, 28, and 29 extending into the recesses in the driven member as shown and, as shown, journaled in the bore 14 and on the bottoms of the recesses in the driven member, and also has the polygonal hub 30, six sided or hexagon in this instance, adapted for the removable operating handle G. The polygonal connection not only affords a good operating wrench-like operating connection between the handle and the driving member but also for easy and quick change of position of the handle for convenience of operators and for adaptation to different kinds of work.

The locking members H, I, and J have the bottoms 31 contactable on the flattened sides of the corresponding ones of the rockable pins, the arcuate tops 32 contactable on the wall of the bore 14, the ends 33 contactable on one side of the prongs 24, 26, and 28, and the ends 34 contactable on one side of the prongs 25, 27, and 29.

The spring 35 is located between the prong 24 and the driving part 18, the spring 36 between the prong 26 and the driving part 19, and the spring 37 between the prong 28 and the driving part 20.

As to operation of the device shown and described:

Starting now from an inactive position of the handle, the members of the device are related as illustrated in Fig. 4 wherein one of the locking members is shown as horizontal in a recess now at the extreme top while the other two are pointing downwardly. An equivalent relation of members is attained irrespective of what rotational position the locking members may be moved into since there are three of them and two of them will always be directed downwardly.

In Fig. 4 is seen that the locking member H is not confined in any specific position except that it is voluntarily resting on the pin 21 while the locking member I has dropped downwardly, due to gravity, and into a wedging or locking position between the pin 22 and the wall of the bore while the locking member J has dropped downwardly, due to gravity, and into a wedging or locking position between the pin 23 and the wall of the bore so that the two members I and J are rotatively in opposite wedging positions and thereby prevent rotation of the driven member in either direction upon or due to pressure brought thereon from the clamp.

This condition also prevails when the handle is at rest after completing an unclamping movement, irrespective of whether it is at rest on one side of the center or at the other, so that the handle and the clamp will automatically remain in whatever unclamping position the operation of the handle may have placed it into and thereby eliminates the necessity of holding the handle for holding the clamp in an unclamping position, leaves both of an operator's hands free for loading and unloading of the jig and thereby saves considerable time, eliminates the possibility of the clamp dropping down unexpectedly and spoiling work or injuring an operator, prevents unlocking of the locking mechanism when pressure is accidentally or inadvertently brought upon the clamp, and impells the operation of the handle for a movement of the clamp.

Upon rotation of the handle in the direction of the arrow thereon, for a clamping movement of the clamp, the prongs are moved in the same direction.

The springs normally hold the prongs 24, 26 and 28 spaced from the driving parts 18, 19 and 20, respectively.

Upon beginning of this clamping movement, the prongs 24, 26 and 28 begin to compress the springs, the prong 25 moves forward rotatively but does not contact the member I, the prong 27 also moves forward and moves the member J out of the locking position thereof, and the prong 29 moves toward the member H but does not move it into a locking or wedging position so that the driven member E is now completely unlocked for a clamping movement of the clamp through the geared relation of the clamp and the driven member.

Upon continuation of clamping movement of the handle, the member E begins to rotate forwardly and thereby moves the clamp toward a clamping position.

Upon arrival of the clamp at a clamping position, as contact of the clamp on an article, a resistance against rotation of the shaft and the driven member is set up.

Since it is desirable that the clamp should clamp the article tightly and since the article now arrests further clamping movement of the clamp, a pressure must be produced on the clamp through the operating handle.

Upon continuation of clamping movement of the handle, against the resistance to clamping movement now offered by the clamp and transmitted to the driven member and the driving parts thereon, the prongs 24, 26 and 28 begin to compress the springs against the now practically stationary driving parts and thereby increases the pressure thereon which pressure is transmitted to the clamp for increase of pressure between the clamp and the article.

While the prongs are so continuing to move for spring compression, the prong 25 moves the member I and the prong 27 moves the member J and the prong 29 moves the member H into tight wedging positions between

the corresponding pins and the wall of the bore and thereby prevents reverse movement of the driven member and consequently against unlocking movement of the clamp.

This movement of the members I, J and H may continue up to any desired compression of the springs and consequent pressure of the clamp on the article but is terminated automatically when that movement has proceeded far enough to contact the prongs 24, 26 and 28 onto the driving parts 18, 19 and 20 as shown in Fig. 5 since the entire mechanism in the casing is now the equivalent of a solid mass locked against rotation in the positionally stationary casing and neither the operating mechanism nor the clamp can move of itself nor can the operating mechanism be moved upon pressure from the clamp but can be moved only by operation of the handle which first releases the locking.

In the manner just described, one clamping operation of the handle automatically releases the locking, moves the clamp into clamping position, automatically regulates the clamping and locking pressure for easy release of the locking, automatically locks the clamp in clamping position, and automatically limits the locking pressure.

Upon a reverse movement of the handle, an unclamping movement, in a direction opposite the arrow thereon, the prongs 24, 26 and 28 first move all of the locking members out of their locking positions, the operating mechanism and the clamp then move for an unclamping movement, and at least two of the locking members automatically drop into locking positions as shown in Fig. 4 upon completion of this reverse movement of the handle and thereby locks the operating mechanism and the clamp against movement in either direction by pressure brought upon the clamp or transmitted to the operating mechanism from the clamp as long as the handle is not operated.

In the manner just described, one unclamping movement of the handle automatically releases the locking, moves the clamp into an unclamping position, and automatically locks the clamp in the unclamping position.

As mentioned above, I am aware that my invention is applicable to devices other than the one device shown in the accompanying drawing and specifically described herein but I am also aware that changes and modifications can be made in the structure and arrangements of the parts so shown and described within the spirit and intent of my invention and of the appended claims; therefore, without limiting myself to the precise application of my invention as shown and described nor to the specific structure and arrangement of the parts as shown and described.

I claim:

1. An operating and locking means for movable clamps including an operating mechanism for moving a clamp into various positions including a driven member and a driving member free moving to operate said driven member, wedge members adapted to automatically move into positions to lock said operating mechanism and the clamp against movement thereof when the same are not acted by said driving member, driving parts on said driving and driven members and adapted for driving contact thereof, and a spring between adjacent ones of said parts.

2. An operating and locking means for movable clamps including a direct driven operating mechanism for moving a clamp into clamping and unclamping positions, free moving wedge members adapted to automatically move into positions to lock said operating mechanism and the clamp against movement thereof when the same are not acted upon, and members on said operating mechanism adapted to automatically move said wedge members out of locking positions thereof at the beginning of a clamping movement of the clamp and to automatically wedge the same for locking at the end of the clamping movement.

3. An operating and locking means for movable clamps including a direct driven operating mechanism for moving a clamp including a driven and a driving member having parts contactable on each other, wedge members adapted to move into locking contact with members of said operating mechanism, a spring between some of said contactable parts normally keeping the same apart and compressed by movement of said driving member upon resistance to movement brought upon said operating mechanism through said clamp to wedge said wedge members firmly into locking position until stopped in said compression and said wedging upon contact of said parts and consequent arrest of further movement of said driving member in the same direction.

4. An operating and locking means for movable clamps including a direct driven operating mechanism for moving a clamp into clamping and unclamping positions, a locking mechanism adapted for automatically locking said operating mechanism against operation thereof through the clamp, a driving mechanism adapted, upon operation thereof, to release said locking mechanism for operation of said operating mechanism, then operate said operating mechanism for a clamping movement of the clamp, then operate said locking mechanism for locking of said operating mechanism against reverse movement thereof upon resistance from the clamp to said operating mechanism, then arrest the clamping movement upon a definite wedging pressure between said locking and operating mechanisms, then, upon a reverse operation of said driving mechanism, release the lock-

ing, and then move the clamp into an unclamping position whereupon said clamping mechanism automatically locks said operating mechanism and the clamp against movement through the clamp.

5. An operating and locking means for movable clamps including a direct driven operating mechanism to move a clamp in either direction, and a locking mechanism for said operating mechanism having a freely movable locking shoe adapted to be releasably wedged against said operating mechanism to lock the clamp against self reversing movement from any position thereof and to be released for operation of said operating mechanism and the clamp.

6. An operating and locking means for movable clamps including a casing having a bore, an operating mechanism for moving a clamp having a driven member located in said bore and having a recess therein, a driving member having prongs extending into said recess for driving contact on said driven member, a rock pin journaled in said driven member and extending above the bottom of said recess, and a locking shoe loosely in said recess between said rock pin and the wall of said bore and said prongs and movable transversely of said rock pin for locking and unlocking.

7. An operating and locking means for movable clamps including a casing having a bore, interlocking directly contactable driven and driving members in said bore, locking members loosely between said driven and driving members and the wall of said bore and movable into and out of wedging positions between said wall and said driven member upon contact of said driving member thereon when the same is moving.

8. A jig device including a clamp movable into clamping and unclamping positions, a direct driven operating mechanism to move said clamp, freely moving wedge members adapted to automatically move into positions to lock said mechanism and said clamp against movement thereof, and members on said mechanism adapted to automatically move said wedge members out of locking positions thereof at the beginning of a clamping movement of the clamp and to automatically wedge the same for locking at the end of the clamping movement.

9. A jig device including a clamp movable into clamping and unclamping positions, a direct driven operating mechanism to move said clamp in either direction, and freely moving wedge members each adapted to automatically move into positions to lock said mechanism and said clamp against self reversing movement thereof at the end of a moving operation for said clamp and to be automatically released upon beginning of a moving operation for said clamp.

10. A jig device including a clamp movable into clamping and unclamping positions, an operating mechanism to move said clamp, including a driven and a driving member relatively movable and having parts contactable on each other for driving, freely moving wedge members adapted to automatically move into locking contact of said driven member and released from the locking contact upon beginning of a moving operation of said clamp, and a spring between some of the contactable parts to be compressed by movement of said driving member for effective wedging of said wedge members into locking positions.

11. A jig device including a clamp movable into clamping and unclamping positions, an operating mechanism to move said clamp and including a driven and a driving member relatively movable and having parts contactable on each other for driving, freely moving wedge members adapted to automatically move into locking contact of said driven member and released from the locking contact upon beginning of a moving operation of said clamp, and a spring between some of the contactable parts to be compressed by movement of said driving member for effective wedging of said wedge members into locking positions; said effective wedging being completed upon contact of said parts to prevent excessive wedging of said wedge members and contact of said parts terminates movement of said operating mechanism.

12. A jig device including a clamp movable into positions to clamp and unclamp articles, an operating mechanism for moving said clamp including a driven and a driving member having parts contactable on each other for driving, freely moving wedge members adapted to move into locking contact with members of said operating mechanism, a spring between some of said parts normally keeping the same apart and compressed by movement of said driving member upon contact of said clamp onto an article to wedge said wedge members firmly into locking positions until stopped in said compression and said wedging upon contact of said parts and consequent arrest of further movement of said driving member in the same direction.

13. A jig device including a clamp movable into positions to clamp and unclamp articles, a direct driven operating mechanism for moving said clamp to clamp and unclamp an article, a locking mechanism having freely moving members adapted for automatically locking said operating mechanism against operation thereof, a driving mechanism adapted, upon operation thereof, to release said members for operation of said operating mechanism, then operate said operating mechanism for a movement to clamp the article, then operate said members for locking of said operating mechanism against unclamping movement, then arrest the clamping movement upon a definite wedging pres-

sure between said members and said operating mechanism, then, upon a reverse operation of said driving mechanism, release the locking and then move the clamp to unclamp the article whereupon said clamping mechanism automatically locks said operating mechanism and the clamp against movement.

14. A jig device including a movable clamp in geared operating relation to a direct driven operating mechanism, a locking mechanism having freely moving members normally locking said operating mechanism against self operation thereof, and a driving mechanism adapted, upon operation thereof, to release the locking of said members, operate said operating mechanism for clamping of an article and locking the same against self unclamping of the article, and, upon a reverse operation thereof, first release the locking of said members and move said clamp into an unclamping position whereupon said locking members automatically assume their normal locking position.

15. A jig device including a clamp movable into clamping and unclamping positions, a direct driven operating mechanism to move said clamp into and out of said positions, and freely moving locking members each adapted to successively and automatically drop by gravity into a locking position of said operating mechanism at the end of a movement of said operating mechanism.

16. A jig device including a clamp movable into clamping and unclamping positions, a direct driven operating mechanism to move said clamp into and out of said positions, and freely moving locking members each adapted to successively and automatically drop by gravity into a locking position of said operating mechanism at the end of a movement of said operating mechanism and to be moved out of said locking position by and upon commencement of a movement of said operating mechanism.

17. A jig device including a clamp movable into clamping and unclamping positions, a direct driven operating mechanism to move said clamp into and out of said positions, freely moving locking members each adapted to automatically move into a locking position of said operating mechanism upon completion of a movement of said operating mechanism, and relatively movable parts in said operating mechanism to limit locking movement of said locking member.

18. An operating and locking means for movable clamps including a casing having a bore, a driven member in said bore and having driving parts, a driving member having prongs extending into said bore, and locking members adapted for locking contact on and release from said bore to, respectively, prevent and permit rotation of said driven member in said casing; each of said prongs being adapted for direct simultaneous contact on one of said driving parts and on one of said locking members when said driving member is moving said driven member in either direction.

19. An operating and locking means for movable clamps including a casing having a bore, a driven member in said bore and having driving parts, a driving member having prongs extending into said bore, a spring between alternately adjacent prongs and driving parts, and locking members adapted for locking contact on and release from said bore; each of said prongs being adapted for direct contact on one of said driving parts and on one of said locking members.

20. An operating and locking means for movable clamps including a casing having a bore, a driven member in said bore and having driving parts, a driving member having prongs extending into said bore, pins journaled in said driven member, and locking members against said pins and adapted for locking contact on and release from said bore; each of said prongs being adapted for direct contact on one of said driving parts and on one of said locking members.

21. An operating and locking means for movable clamps including a casing having a bore, a driven member in said bore and having driving parts, a driving member having prongs extending into said bore, a spring between alternate adjacent prongs and driving parts, pins journaled in said driven member, and locking members against said pins and adapted for locking contact on and release from said bore; each of said prongs being adapted for direct contact on one of said driving parts and on one of said locking members.

22. An operating and locking means for movable clamps including a casing having a bore, a driven member in said bore and having driving parts, a driving member having prongs extending into said bore, and locking members between alternately adjacent ones of said prongs and adapted for locking contact on and release from said bore and normally free to drop by gravity into driven member locking positions; each of said prongs being adapted for direct simultaneous contact on one of said driving parts and on one of said locking members when said driving member is moving said driven member in either direction.

23. An operating and locking means for a movable clamp including an operating mechanism to move said clamp, locking members normally freely movable in relation to said operating mechanism, a driving means adapted for direct driving contact on said operating mechanism and for locking contact on all of said locking members simultaneously to lock said clamp against self reversing movement thereof at the end of a movement of said driving means.

24. An operating and locking means for a movable clamp including an operating mechanism to move said clamp, a normally freely moving, rockably seated locking member adjacent to a member of said operating mechanism, and a driving means for said operating mechanism and moving said locking member into locking position at the end of the driving movement of said driving means.

25 An operating and locking means for a movable clamp including an operating mechanism to move said clamp, normally freely moving locking members adjacent to a member of said operating mechanism, and a driving means for said operating mechanism and moving all of said locking members into locking positions at the end of the driving movement of said driving means.

26. An operating and locking means for a movable clamp including an operating mechanism to move said clamp, normally freely moving locking members adjacent to a member of said operating mechanism and rockably seated to adapt themselves to locking positions, and a driving means for said operating mechanism and moving all of said locking members into locking positions at the end of the driving movement of said driving means.

27. An operating and locking means for a movable clamp including an operating mechanism to move said clamp into clamping and unclamping positions, normally freely moving locking members adjacent to a member of said operating mechanism and rockably seated to adapt themselves to locking positions, and a driving means adapted for direct contact on said operating mechanism and for moving said locking members into locking positions at the end of the driving movement of said driving means.

In testimony of the foregoing, I affix my signature.

GUY E. SWARTZ.