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3,489,447

MECHANICAL ANVIL CAP OR DIE KEY

Filed June 28, 1968

2 Sheets-Sheet 1

FIG. 1.

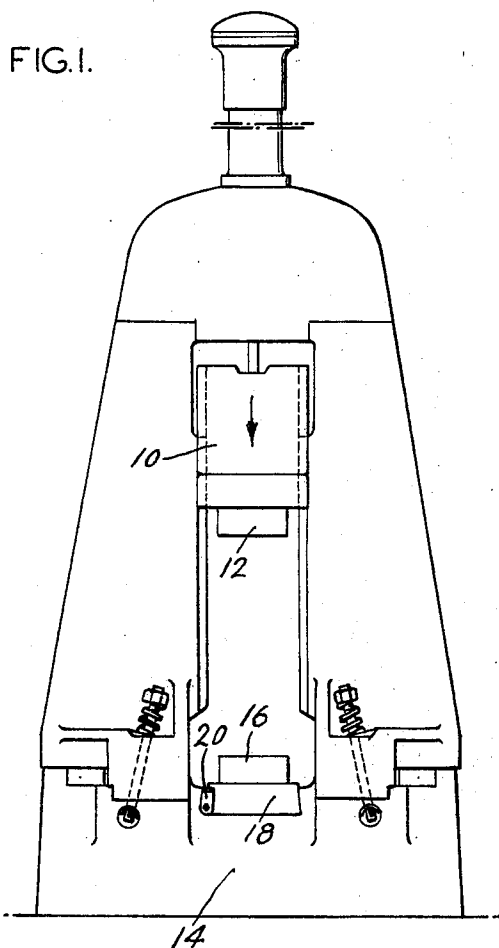


FIG. 2.

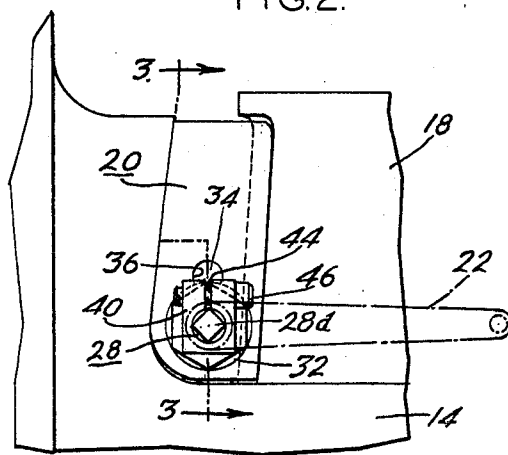
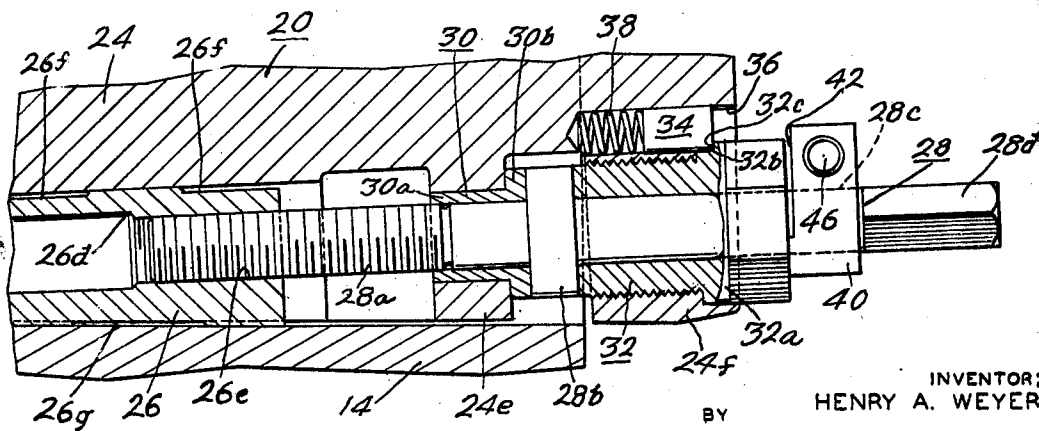


FIG. 5.



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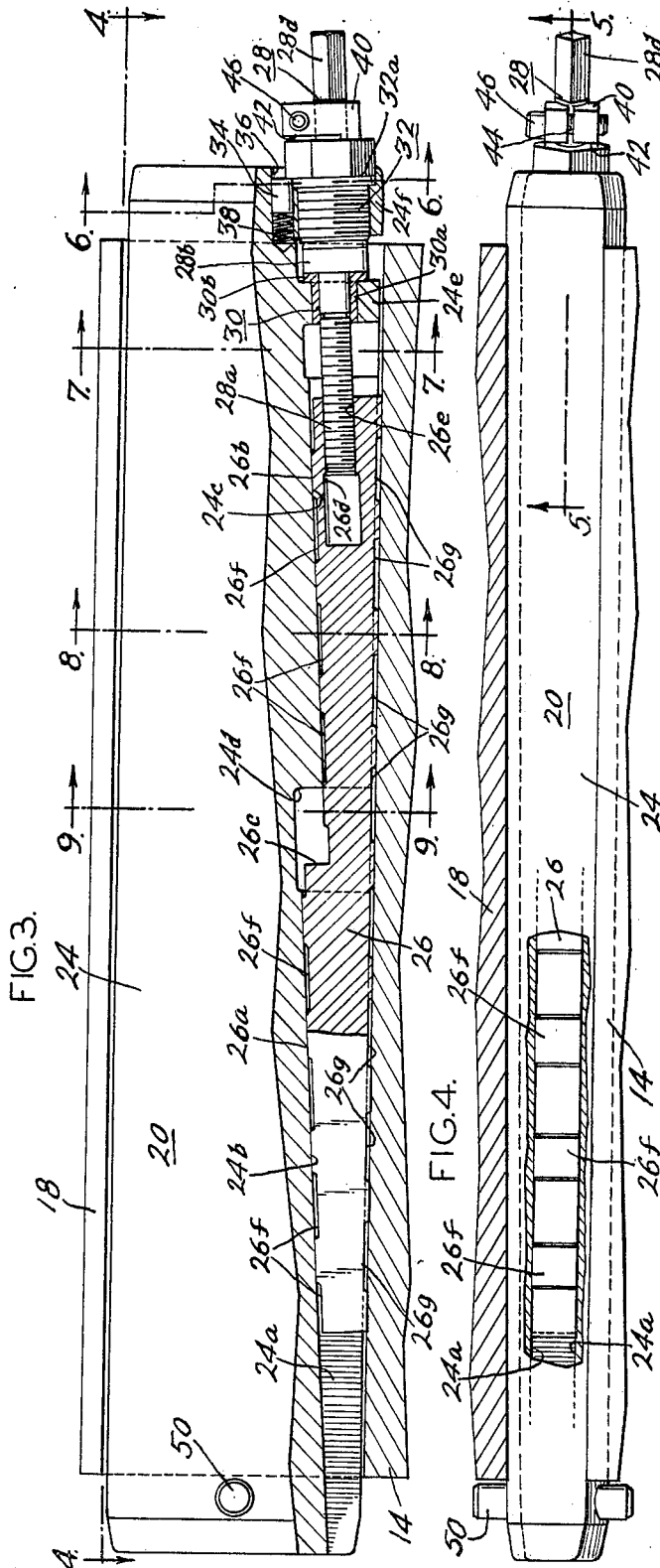
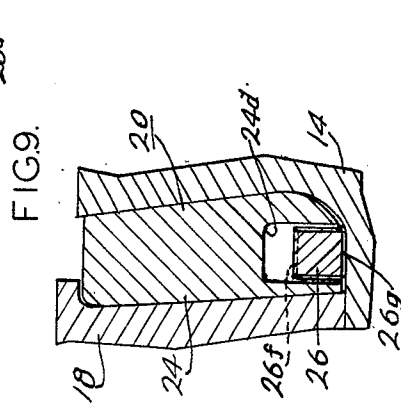
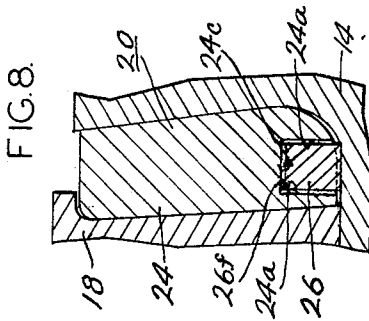
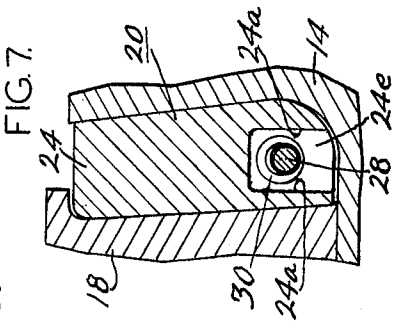
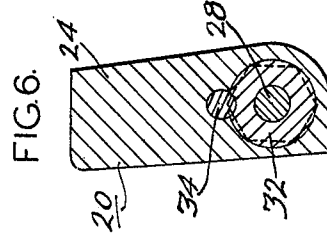
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MECHANICAL ANVIL CAP OR DIE KEY

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2 Sheets-Sheet 2



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MECHANICAL ANVIL CAP OR DIE KEY

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6 Claims

ABSTRACT OF THE DISCLOSURE

A mechanical key for holding an anvil cap or die in place to an anvil in impact machinery employs two elongated blocks which are relatively movable with respect to one another in response to rotation of a bolt providing a screw drive. At least one of the blocks is tapered in any longitudinal cross section in the thickness dimension including a common interface between said blocks. The bolt is parallel to the interface between the two blocks and is rotatably supported by one of the blocks, threadably engages the other and is rotated by a removable manual tool which is applied at one end of the key. The key fits into a channel whose side walls converge from its bottom so that the effective increase in composite thickness causes as wedging of the block remote from the bottom into the converging sidewalls as the result of pressure from the other block resting on the bottom of the channel.

The present invention relates to a mechanical key for locking an anvil cap, die key or the like in place on impacting machinery. More specifically, the present invention relates to such a key composed of a pair of relatively movable elongated blocks, at least one of which is of tapered thickness in any longitudinal cross section including a common interface between said blocks. A threaded bolt moves the blocks longitudinally with respect to one another to effectively increase their composite thickness and provide a wedging action between pieces to be held.

The anvil cap and/or die in impacting machines is normally secured to the anvil by a wedge which is manually hammered into place. Hammering such a wedge into place requires know-how and considerable skill, as well as strength. Considerable effort and skill is also required to remove such a wedge.

In an effort to minimize the time and reduce the skill required in locking an anvil cap or die to an anvil, various types of keys have been proposed, including keys employing hydraulically actuated plungers to move the key into wedging engagement between the pieces to be held. Such devices may be satisfactory in some applications, but have the disadvantage of requiring connection to a hydraulic system, the supply lines of which may be in the way of workers. Hydraulic systems also require costly auxiliary apparatus and, due to the nature of the forces involved, in the course of impacting may experience damage.

The present invention relates to a key which is a simple mechanical structure operating by a wedging action between pieces of its structure to wedge the piece to be held more tightly onto the anvil. The present invention by use of only a wrench or other simple tool, mechanically locks in place the piece to be fixed to the impact machinery. The tool is readily removed after adjustment. The same tool is used for unlocking the piece from the impact machine by an equally simple reverse procedure.

More specifically, the present invention relates to a mechanical key for locking a smaller piece to a piece of impacting machinery by wedging action. First and second elongated narrow blocks, at least one of which has a tapered portion in any longitudinal cross section in the

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thickness dimension including a common interface between the blocks, are employed. Preferably both blocks are oppositely tapered in equal amounts so that edges of the blocks remote from the interface in the thickness dimension remain parallel to one another as the blocks move longitudinally relative to one another.

Means including a threaded bolt member is used to cause relative movement of said blocks in the longitudinal direction along the interface whereby the composite thickness of the two blocks is changed. The bolt member extends parallel to the interface and lengthwise of and rotatable relative to one of said blocks so that the bolt cannot move linearly relative to said one of said blocks. The bolt threadably engages the other of said blocks so that rotational movement causes relative longitudinal movement of the other relative to said one of the blocks, finally means for providing rotation of the bolt member is provided.

For a better understanding of the present invention, reference is made to the following drawings in which

FIG. 1 shows in front elevation a vertical drop hammer employing the mechanical key of the present invention.

FIG. 2 is a much enlarged partial view of the portion of FIG. 1 in the area of the key.

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2.

FIG. 4 is a sectional view taken along line 4—4 of FIG. 3.

FIG. 5 is a sectional view taken along line 5—5 of FIG. 4.

FIG. 6 is a sectional view taken along line 6—6 of FIG. 3.

FIG. 7 is a sectional view taken along line 7—7 of FIG. 3.

FIG. 8 is a sectional view taken along line 8—8 of FIG. 3.

FIG. 9 is a sectional view taken along line 9—9 of FIG. 3.

Referring to FIG. 1, the structure shown is illustrative of a type of device in which the mechanical key of the present invention will find use. A somewhat more detailed description of a device of this general type can be had by reference to my co-pending United States patent application Ser. No. 645,127.

In this instance forging is accomplished by the dropping of hammer 10 which carries the die 12 toward anvil 14 which supports die 16 on anvil cap 18. The present invention will find use with a variety of impact machines so that the device shown is by way of illustration only.

As can be seen from FIG. 1, in a typical impact machine the anvil 14 is provided with a dovetailed channel or ways and the anvil cap 18 or piece to be held to the impact machine is provided with a mating dovetail shape. However, this dovetail is not as wide as the channel in the anvil 14. With the dovetail bottom on the channel bottom one edge of the dovetail preferably engages one wall of the channel snugly in a close fit. With this one edge in place the other edge is spaced from the other wall of the channel in the anvil 14 and is not parallel that other wall. In fact, the other edge of the dovetail and the other sidewall of the channel together with the portion of the channel bottom not covered by the dovetail together form a narrow channel having sidewalls which converge from the channel bottom toward their top. Into this space in accordance with conventional practice is driven a wedge which holds the anvil cap to the anvil.

In accordance with the present invention the mechanical key 20 is substituted for the wedge and preferably, although not necessarily, provided with wedge shaped sides which approximately conform to the convergence of the sidewalls of the narrow channel between the dovetail sidewall of anvil 14 and anvil cap 18. The thickness of

mechanical key is capable of being expanded and in this application the key is oriented in the narrow channel so that its thickness is in the general vertical direction. In this orientation the expansion of the key is between the channel bottom on one hand and the converging channel sidewalls on the other with the effect that the key by expansion is urged more tightly into engagement between the converging sidewalls of anvil 14 and cap 18. This is accomplished by means of a removable wrench 22, shown in dot-dashed lines of FIG. 2, without hammering so that it may be done by an unskilled worker. The results have proven to be as good as can be achieved with the conventional hammered wedge.

As seen in FIGS. 3-9 the mechanical key, generally designated 20, is composed of a pair of elongated blocks 24 and 26, at least one of which has a tapered portion in any longitudinal cross-section in a thickness dimension including a common interface between said blocks. As can best be seen in FIGS. 3, 7, 8 and 9, the blocks are not of the same size in this preferred embodiment. In fact, the larger block 24 is the key member which actually provides the key between the anvil 14 and the anvil cap 18. In this embodiment key member 24 is slightly wedge shaped in cross-section, conforming to the shape of the wedge shaped opening between the anvil cap and anvil. It is somewhat shorter in the thickness dimension than the space between the anvil cap and the anvil so that, as it is slipped in along the channel bottom provided by the anvil, it will not be tightly wedged against the channel sidewalls provided by the anvil and anvil cap. The smaller of the two elongated blocks 26, acts to urge the key member 24 upward from the bottom of the channel and into contact with the channel sidewalls.

As is clearly seen in FIGS. 7, 8 and 9, the wedge member 26 is a slide member in an inverted channel extending lengthwise along the bottom of the key member 24. The sidewalls of inverted channel 24a snugly confine the wedge member 26 in order to prevent lateral movement and guide longitudinal movement between the two members. In any embodiment of the present invention, at least one of the two elongated members 24 and 26 is wedge shaped in any longitudinal cross-section in the thickness dimension including a common interface between said blocks. Preferably as here, the two members are tapered in complementary fashion, i.e., the tapered portion of one block is opposed at the interface to an oppositely tapered portion of the other block. Both blocks are tapered in equal amounts but in opposite directions so that the opposite edges of the blocks remote from the interface in the thickness dimension remain parallel to one another as the blocks move longitudinally relative to one another. This effect can best be seen in FIG. 3. In this case there are two successive tapers in sawtooth fashion. This arrangement is provided in order to give a steeper pitch to each of the tapers, in turn to permit greater effective change in the thickness dimension with less change in the longitudinal direction of wedge member 26 relative to key member 24. In this case there are effectively two interfaces, one where the upper surface 26a of wedge member 26 contacts the bottom portion 24b of the inverted channel 24a. Another portion 24c of the inverted channel bottom contacts top surface 26b of wedge member 26. Between these respective surfaces are offsets 24d and 26c, respectively, in the key member 24 and wedge member 26. Depending upon the requirements in a particular embodiment, additional steps can be provided in the wedge member and in the channel as needed, and in other embodiments only a simple wedge member will be employed.

Driving the wedge member 26 longitudinally relative to the key member 24 either engages or disengages the key member between the anvil 14 and the anvil cap 18. Relative movement of these elongated blocks along their interfaces, thereby changing the composite thickness of the two blocks, is provided by a threaded bolt member,

generally designated 28. Bolt 28 extends parallel to the interfaces and is so oriented that it extends lengthwise of each of the blocks. The bolt member 28 in the embodiment shown is rotatable relative to key member 24, but held so that it cannot move linearly relative to that elongated block. The bolt is threadably engaged in a recess 26d in the end of wedge member 26 so that rotational movement of the bolt 28 causes longitudinal movement of the wedge member 26 relative to the key member 24.

In order to support the bolt 28, the key member 24 has flanges 24e and 24f transverse to and projecting beyond the extended plane of the interface 25c-26b. Bores are provided through the flanges to receive the bolt member 28. For the purpose of understanding the structure of the bolt 28, reference is made to FIG. 5. As can be seen in FIG. 5, the threaded end 28a of bolt 28 engages in threaded portion 26e of recess 26d in wedge member 26. The bolt passes through aligned bores in flanges 24e and 24f. Within the bore of flange 24e is placed a flange bearing 30. The tubular portion 30a of bearing 30 fits snugly within and is preferably press fitted within the bore in flange 24e. The radial flange 30b extends to a larger diameter and provides a shoulder against which radially outwardly extending flange 28b of bolt 28 is held against motion in one axial direction. The bore through flange 24f is sufficiently larger to accommodate passage of bearing 30 and flange 28b, which are assembled through that bore in that order. The bore in flange 24f is provided with a threaded portion which engages threads on a portion of the outer diameter of bearing member 32. Bearing member 32 is designed to bear against the other side of radially outwardly extending flange 28 from bearing member 30 to hold this flange, and hence the bolt 28 in position longitudinally of the key member 24. Threaded bearing member 32 is, of course, removable to remove the bolt and the bearing 30 in the opposite way from the direction in which they are assembled.

Key means in the form of a cylindrical key 34, holds the threaded bearing member 32 in selected position relative to the key member 24. While the key means may be of other shape, it is advantageously cylindrical in form and retained in a cylindrical keyway 36 in the key member 24. A concentric flange 32a of slightly larger diameter than the threaded portion 32 of threaded bearing member 32 is accommodated in a slightly larger diameter counterbored portion of flange 24. This flange overlaps the keyway 36 in key member 24 and the cylindrical keyway 36 is extended, as portion 32b, some distance into the flange 32, where it is terminated in a shoulder 32c to limit the movement of the cylindrical key 34. A compression spring 38, trapped at the end of the cylindrical bore between the end of the bore and the cylindrical key, urges the key 34 outwardly of the keyway 36 and into the shoulder 32c, as seen in FIG. 5. It will be apparent to those skilled in the art that the key 34 may be released from this position by pressure inwardly on the key by a tool, such as a screwdriver, to compress the spring 38 and until the key 34 passes the end of flange 32a. At this point, the threaded bearing member 32 is freely rotatable, and once rotated so that its part of the keyway is out of alignment with the rest of the keyway the key cannot re-enter the portion of the keyway 32b in the threaded bearing member until the keyway portions are realigned. The key may be held depressed with an appropriate tool within the keyway portion to the left of the flange 32a as viewed in FIG. 5. In this position the threaded bearing member may be either screwed into position or screwed out of position, as the situation may warrant.

It will be observed that the keyway extends generally parallel to the bolt member and preferably most of the keyway is within the wedge member 24 in order conveniently to retain the key at all times. This is true even in the portion 32b of the keyway which terminates in

the shoulder 32e. Circumferentially less than half of the portion of the cylindrical key actually in contact with shoulder 32a in locking position is in the keyway portion 32b of threaded bearing member 32.

In order to prevent the bolt 28 from turning relative to supporting wedge member 24 once a selected position has been achieved, clamp means is provided on one of the elongated blocks. Clamp means is preferably provided on the key member 24 and more precisely on the threaded bearing member 32, which, when the key 34 is in place, acts as an integral part of the key member 24. The purpose of the clamp means is to deter rotation once position is selected. Here the clamp means 40 is provided by an integral portion of the member 32. This clamp means has a bore through it aligned with the bore through the flanges 24e and 24f and snugly accommodates a smooth cylindrical portion 28c of the bolt 28. The clamp is separated from the threaded bearing member 34 by a transverse cut 42 as seen in FIG. 2. Perpendicular to the transverse cut is a cut 44 into the cylindrical bore from one edge.

If the clamp portion is generally rectangular, as shown, a transverse bore through the clamp generally parallel to cut 42 and across cut 44, is used to accommodate bolt 46. The bore on the side of the cut 44 adjacent the bolt head is unthreaded and the bore on the other side is threaded to engage the threads of bolt 46. Thus the clamp may be tightened on adjustment bolt 28 by rotation of the clamping bolt 46 in such direction as to narrow the cut 44. Bolt 28 is released by rotation of the clamping bolt 46 in the opposite direction.

When released, the adjusting bolt 28 is free to be rotated by wrench 22 which in the illustrated embodiment fits over square end 28d of the adjusting bolt 28. Adjustment to tighten the wedge into position with a right-hand adjusting bolt 28 is done by the tool 22. In order to tighten the key into position, the wrench 22 is rotated counterclockwise, in FIG. 2, moving the wedge 26 to the left relative to the key member 24, as best seen in FIGS. 3 and 5. This has the effect of expanding the thickness of the mechanical key.

The inverted channel in the key member 24 provides ways for the wedge member 26 and holds the wedge member in proper position within close tolerances as previously described. However, during impact of the machine, some resilience of the structure is desirable and hence on the wedge member 26 bearing areas are opposed on opposite edges by undercuts. The undercuts are seen as shallow transverse grooves in FIGS. 3 and 4, identified as 26f along the top of the wedge and 26g along the bottom.

In the construction shown in the drawings, the opening between the anvil cap and the anvil is slightly tapered in the lengthwise direction, narrowing from the end providing bolt adjustment to the opposite end. The key member 24 is lengthwise tapered in order to conform this tapered space. However, in the course of impacting because the sides are not exactly parallel there may be some tendency for the key to drift and loosen. In order to prevent such effects, a transverse bore may be provided through the key member in order to accommodate a pin 50, whose ends extend beyond the key member 24 to overlap the ends of the anvil 14 and the anvil cap 18, as best seen in FIG. 4. This overlap will tend to prevent lengthwise drift of the key member.

Should the key be used in a situation where it may become stuck in position, a further wedge along its top edge corresponding to wedge 26 along the bottom edge of key member 24 may be provided, corresponding in shape and size or assuming variations from the wedge member 26.

Various modifications of the preferred embodiment of the present invention illustrated herein have been suggested. Other modifications will occur to those skilled in

the art. All such modifications are intended to be within the scope and spirit of the present invention.

I claim:

1. A mechanical key for locking a smaller piece to a larger piece of impacting machinery by wedging action comprising

first and second elongated blocks, the tapered portion of one block being opposed at an interface to a tapered portion of the other block,

means causing relative movement of said blocks in the longitudinal direction along said interface whereby the composite thickness of the two blocks is changed, said means including

a threaded bolt member extending lengthwise of the blocks parallel to said interface and having a radially outwardly extending flange and means to permit rotation of said bolt member,

at least a pair of flanges on one of said blocks extending transversely to and projecting beyond the extended plane of the interface, said flanges rotatably supporting said bolt member which passes through openings in said flanges, with the radially outwardly extending bolt flange positioned between said flanges so that the bolt member is retained in place in an axial direction,

at least one bearing member rotatably supporting said bolt member in the opening in one of the flanges and having a threaded outer cylindrical surface which mates with threads in the opening in the flange by which it is supported, and an elongated cylindrical key retained in a cylindrical keyway in the flange and bearing member extending lengthwise generally parallel to the bolt member mating threaded regions so that the key in the keyway acts to hold the bearing in position fixed against rotation.

2. The mechanical key of claim 1 in which the portion of the keyway in the bearing member terminates in a shoulder which limits further movement of the cylindrical key, in which less than half the cylindrical keyway is in the threaded bearing member and a spring is provided between the walls of the keyway and the cylinder key means to urge the cylinder toward said shoulder.

3. A mechanical key for locking a smaller piece to a larger piece of impacting machinery by wedging action comprising

a first and second elongated blocks, at least one of which has a tapered portion in any longitudinal cross-section in the thickness dimension including a common interface between said blocks,

means causing relative movement of said blocks in the longitudinal direction along said interface whereby the composite thickness of the two blocks is changed, said means including

a threaded bolt member parallel to said interface supported by, extending lengthwise of, and rotatable relative to one of said blocks so that said bolt cannot move linearly relative to said one of said blocks and threadably engaging the other of said blocks so that rotational movement causes relative longitudinal movement of the other relative to said one of said blocks, and means for providing rotation of said bolt member.

4. A mechanical key for locking a smaller piece to a larger piece of impacting machinery by wedging action comprising

first and second elongated blocks, the tapered portion of one block being opposed at an interface to a tapered portion of the other block,

means causing relative movement of said blocks in the longitudinal direction along said interface whereby the composite thickness of the two blocks is changed, said means including

at least one bearing member supporting said bolt member in the opening in one of the flanges and having a threaded outer cylindrical surface which

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mates with threads in the opening in the flange by which it is supported, and
 clamp means on the removable threaded bearing member arranged to act upon the bolt member to hold it in place to deter rotational movement out of a selected position.

5. The mechanical key of claim 4 in which the clamp means is mechanically part of the structure of the threaded bearing member and is located at the end-most portion of said threaded bearing member away from the end of the supporting block.

6. A mechanical key for locking a smaller piece to a larger piece of impacting machinery by wedging action comprising

first and second elongated blocks, at least one of which has a tapered portion in any longitudinal cross-section in the thickness dimension including a common interface between said blocks, in which the first elongated narrow block is a slide and the second elongated block member provides ways for the slide in order to prevent lateral movement between the two members, and in which at least one of the elongated narrow blocks is tapered lengthwise so that effectively the mechanical key structure has a lengthwise taper, means causing relative movement of said blocks in the longitudinal direction along said interface whereby the composite thickness of the two blocks is changed, said means including

a threaded bolt member parallel to said interface supported by, extending lengthwise of, and ro-

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tatable relative to one of said blocks so that said bolt cannot move linearly relative to said one of said blocks and threadably engaging the other of said blocks so that rotational movement causes relative longitudinal movement of the other relative to said one of said blocks, a transverse pin through said at least one lengthwise tapered block at its narrow end in order to bear against at least one of the pieces held together by the mechanical key, and means for providing rotation of said bolt member.

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U.S. Cl. X.R.

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