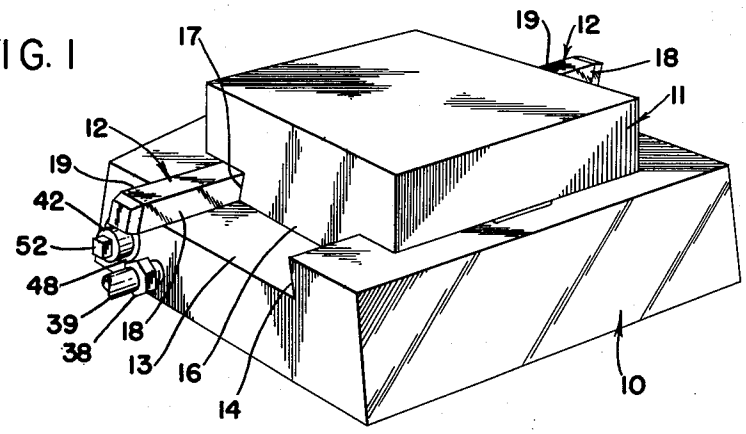
Jan. 29, 1963 E. D. STUHLDREHER 3,075,416

DIE BLOCK HOLDER

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FIG. 1



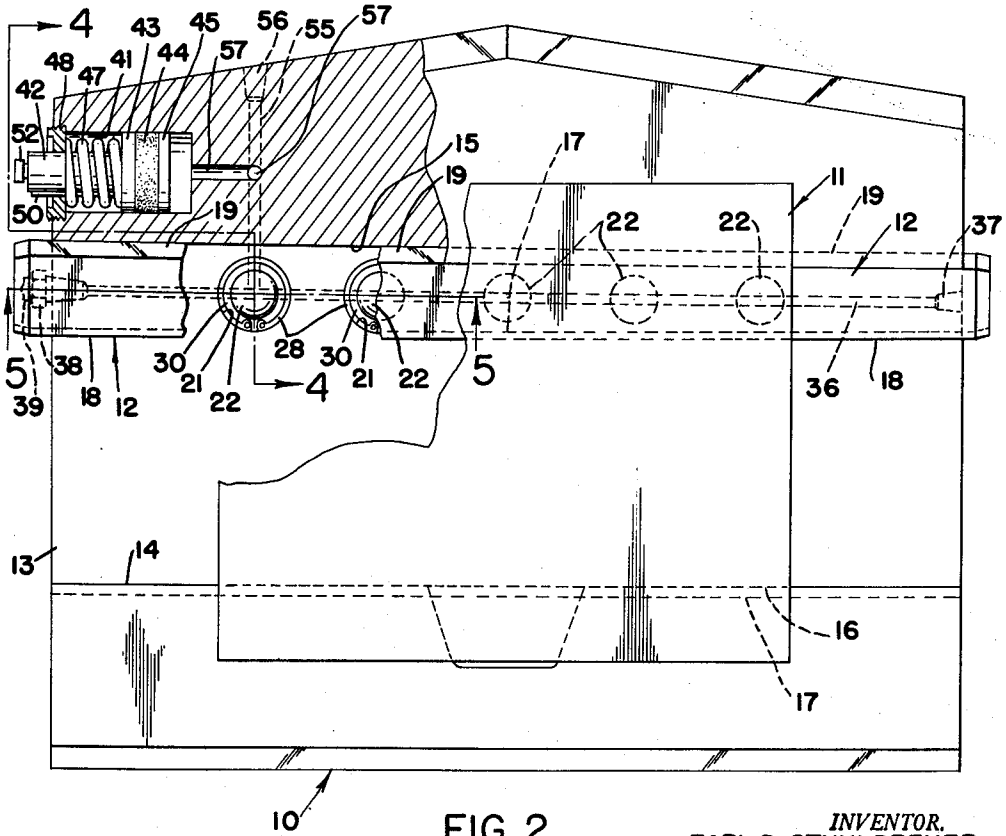


FIG. 2

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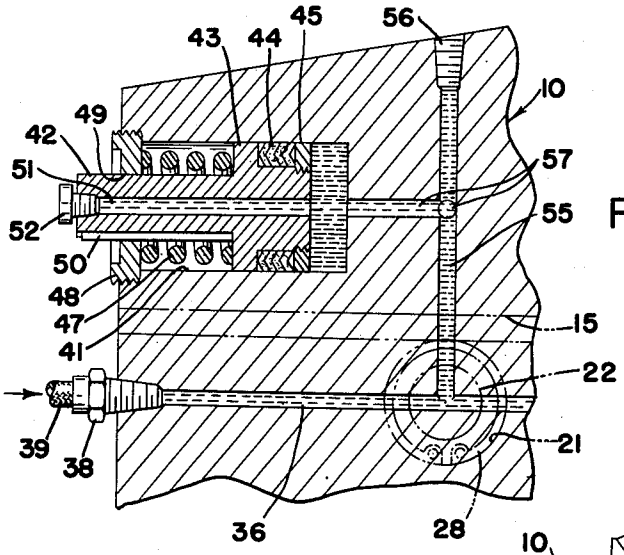


FIG. 3

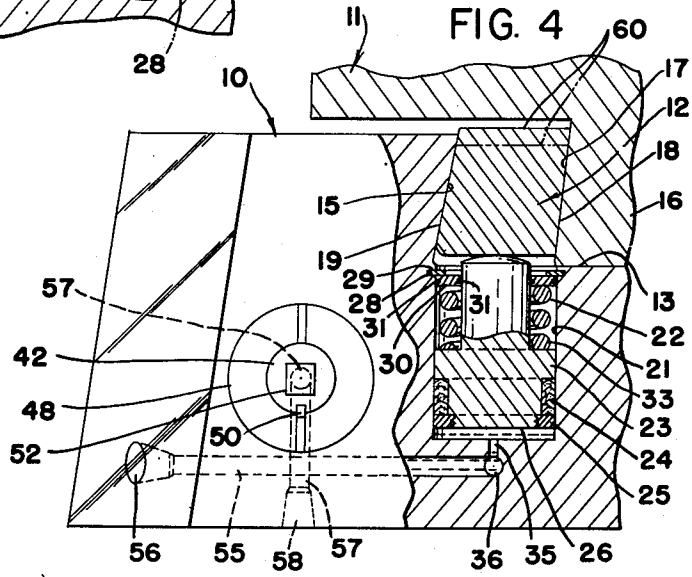


FIG. 4

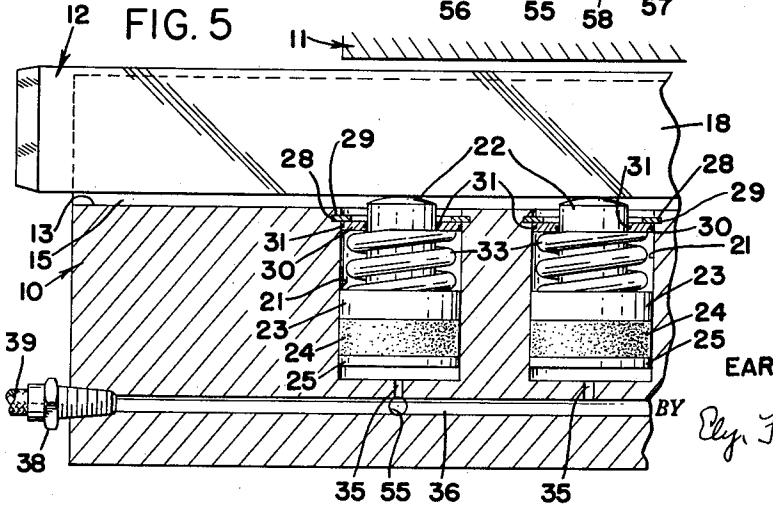


FIG. 5

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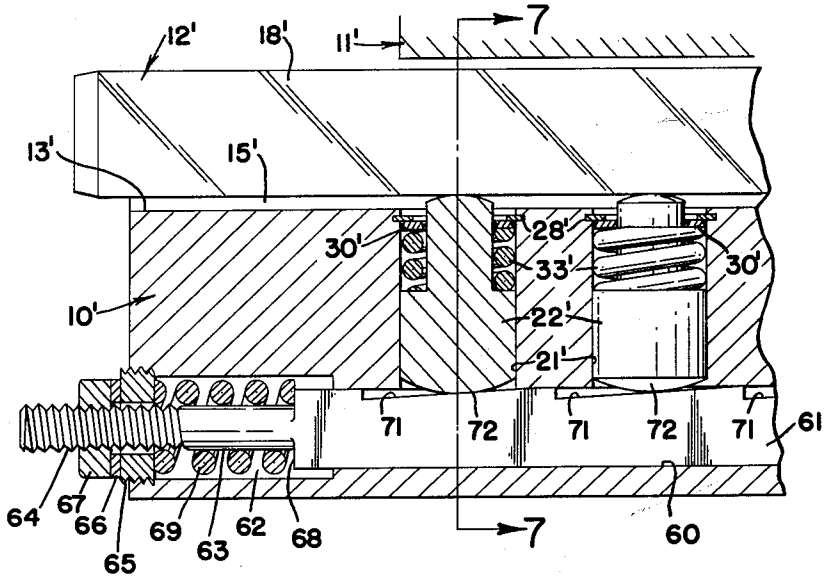
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FIG. 6



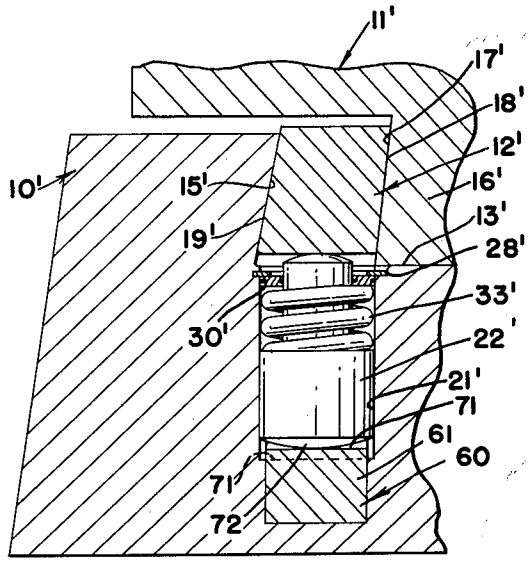


FIG. 7

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United States Patent Office 3,075,416 Patented Jan. 29, 1963

3,075,416

DIE BLOCK HOLDER

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Filed Apr. 14, 1959, Ser. No. 806,359
6 Claims. (Cl. 78—44)

This invention relates to improvements in a die block holder of the type used with drop hammers in the drop forging art. More particularly, it relates to novel means for quickly securing a die block to and quickly releasing it from the sow block or base, anvil or ram.

Heretofore, in the drop forging art, the lower die block has been secured to the sow block by means of a tapered key which is driven into locikng position with great force so that the key cannot be dislodged accidentally. As a result of continued pounding from the drop hammer on the lower die block, the key became distorted and was extremely difficult to remove when it became necessary to remove and replace the die block, and the key could not be used again.

One of the objects of this invention is to provide a construction wherein the key is held tight in proper locking position between the sow block and die block with a vertical force which is sufficient to withstand the constant pounding from the drop hammer without distorting the key, and which force may be quickly relieved when it is desired to remove the key and replace the die block.

Another object is to provide hydraulic means to furnish the vertical force acting on the key to lock the sow block and die block together.

A further object is to provide a modified arrangement wherein mechanical means may be used in lieu of the hydraulic means to furnish the force referred to.

A further object is to provide the sow block with a plurality of pins or pistons at spaced intervals which will be forced against the key, to lock it in place, by either hydraulic or mechanical means, and after the force is relieved, the pins or pistons will be spring actuated to return to their initial position.

A further object in connection with the hydraulic means is to provide a reserve pressure mechanism which will function upon small pressure drops in the hydraulic line to restore sufficient pressure to keep the key locked in position, and will furnish the operator with visible means to determine whether the key is properly locked to withstand hammering operations.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawings.

In the drawings:

FIG. 1 is a reduced perspective view of a sow block with the lower die block held therein in accordance with the present invention.

FIG. 2 is an enlarged plan view of the elements shown in FIG. 1, with parts broken away and shown in section or elevation, for the sake of clarity.

FIG. 3 is an enlarged fragmentary section of the upper left hand corner of FIG. 2, taken in a plane below the key.

FIG. 4 is an enlarged fragmentary section taken substantially on the line 4—4 of FIG. 2, with some parts being shown in elevation.

FIG. 5 is a similar section taken substantially on line 5—5 of FIG. 2, with some parts being shown in elevation.

FIG. 6 is a fragmentary section of a modified form of the invention, with some parts in elevation, and

FIG. 7 is a similar section taken substantially on line 7—7 of FIG. 6, with some parts in elevation.

Referring to the drawings, the numeral 10 designates a sow block, in which a lower die block 11 is adapted to be removably held with the assistance of a key 12. The

block 10 has a longitudinal dovetail groove or recess 13 therein which is co-extensive with the block and has its walls 14 and 15 converging slightly from left to right, as viewed in FIG. 2. The wall 14 is undercut at an angle of about 7° with respect to the vertical, while the wall 15 is similarly undercut at an angle of about 10°, which is standard practice in this art.

The die block 11 has a dovetail extension or tongue 16 which extends into the recess 13 and is of lesser width than said recess. Both sides 17 of tongue 16 are tapered at an angle of about 7° with respect to the vertical so that either side 17 may be brought into face to face contact with wall 14 of recess 13, but sides 17 do not converge as do walls 14 and 15 of recess 13. The upper surface of die block 11 will ordinarily contain any suitable configuration into which the metal being forged is to be pounded by the drop hammer, as will be understood.

The key 12 has tapered sides 18 and 19 which converge from left to right (as viewed in FIG. 2) at an angle about equal to the angle of convergence of the walls of recess 13. Side 18 of the key is tapered at an angle of about 7° with respect to the vertical so that it may be brought into face to face contact with one of the sides 17 of tongue 16, while side 19 of the key is tapered at an angle of about 10° with respect to the vertical so that it may be brought into proper contact with wall 15 of recess 13 (FIG. 4).

Those portions of the sow block, die block and key which have been described are standard equipment for use with drop hammers, and form no part of the present invention except in combination and cooperation with my novel die block holding means to be described.

The preferred form of die holding means is shown in FIGS. 1 to 5 and will be called the hydraulic means. As shown, adjacent the wall 15 and in alignment with the key 12, the sow block 10 is provided with a plurality of spaced, annular, vertical cavities 21, which constitute in effect cylinders for pistons or pins 22 mounted for vertical movement in said cylinders. In this instance five of the cylinders and pistons have been shown, but this number may be increased or reduced in accordance with the size of the blocks being used. Each piston or pin 22 has an enlarged flanged portion 23 intermediate its ends which engages the cylinder wall. Below flange 23 each piston is surrounded by a suitable packing gland 24 held in place by a ring 25 which is threaded on the lower reduced end 26 of the piston. Slightly below the upper end of each cylinder, a conventional C-shaped, removable snap ring 28 is snapped into a groove 29 in the cylinder wall and extends part way into the cylinder. Beneath ring 28 a stop collar 30, preferably having rubber O-rings 31 or suitable hydraulic packing carried in grooves in the inner and outer periphery of collar 30, surrounds the upper end portion of piston 22, while between collar 30 and flange 23, a coil spring 33 surrounds each piston, said spring having a normal bias urging the pistons downwardly in their respective cylinders.

The lower end of each cylinder 21 is connected by a short vertical passage 35 with a horizontal transverse passageway 36 formed in the bottom portion of the sow block. One end of passageway 36 is plugged up as at 37, while its opposite end receives a high pressure fluid intake fitting 38 which is adapted to receive one end of high pressure fluid line 39 that leads to a source (not shown) of high pressure fluid, which can either be air or liquid. The fitting 38 may contain the usual check valve (not shown) to prevent a back flow of fluid, or such valve could be placed at another point in the line 39.

Adjacent intake fitting 38, the sow block 10 is provided with reserve pressure mechanism that cooperates with the fluid acting on pistons 22 under conditions which will be described. As shown, the sow block is provided with an

annular cavity 41 extending horizontally that constitutes a cylinder for a piston 42. Piston 42 has an enlarged flanged portion 43 intermediate its ends which engages the cylinder wall. Inwardly of flange 43, piston 42 is surrounded by a suitable packing gland 44 held in place by a ring or nut 45 threaded on the reduced head of the piston. Outwardly of flange 43, piston 42 is surrounded by a coil spring 47 which extends between the flange and a ring or nut 48 threaded into the end of cylinder 41. Spring 47 has a normal bias tending to urge piston 42 inwardly, or to the right as viewed in FIGS. 2 and 3. The shank of piston 41 is movable through an opening 49 in nut 48, and is keyed as at 50 to nut 48 to prevent the piston turning. Piston 42 is provided with a longitudinal passage 51 therethrough which is closed at its outer end by a removable threaded plug 52, while its inner end communicates with the interior of cylinder 41 adjacent its inner end.

Intermediate the ends of passageway 36, one end of a passageway 55 is connected, while its other end extends to the end of sow block 10 where it is permanently plugged, as at 56. Passageway 55 has a right-angled passageway 57 connected between it and the inner end of cylinder 41, and passage 57 is continued to the end of the sow block where it is permanently plugged, as at 58 (FIG. 4).

When the blocks are ready to be used in a drop hammering operation, the die block 11 is placed in the groove 13 of the sow block with one of its sides 17 in face to face contact with wall 14 of the groove. This leaves a space between the other side 17 of block 11 and wall 15 of groove 13, which space is filled by manually inserting key 12 therein, from left to right as viewed in FIGS. 1 and 2, until the key fits tightly in the space. Fluid under pressure is now forced through fitting 38 into passageway 36 from which it enters cylinders 21 and 41. When the pressure is sufficient, the fluid in cylinders 21 will force pistons 22 upwardly against the action of springs 33. This upward movement of pistons 22 is about equal to the distance from the broken line 60 to the full line 60, indicating the top of key 12 in FIG. 4, and the force applied against the key will securely lock the die block to the sow block so as to withstand the necessary drop hammer operations.

While the pistons 22 are being forced upwardly, the pressure fluid enters cylinder 41 through passages 55 and 57. This fluid first fills the passage 51 in piston 42 and then forces piston 42 outwardly against the action of spring 47. This outward position of piston 42 is shown in FIGS. 2 and 3, and when the piston is in this position, the operator has a visible means of telling that there is sufficient pressure acting against pistons 22 to securely lock the blocks together, because if there were not sufficient pressure the action of spring 47 would not be overcome by the fluid and piston 42 would not move to its outer position.

If the pressure in the passages leading to cylinders 21 should drop accidentally, or if the pressure was reduced while the machine was not being used, without it being desirable to remove the key 12, as soon as the pressure in cylinder 41 is lower than the pressure of spring 47, this spring will move the piston 42 inwardly. This inward movement of piston 42 will move at least some of the fluid out of cylinder 41 and provide enough additional pressure against pistons 22 to hold them in position against the action of springs 33. When the operator wanted to use the machine again, he would note that the piston 42 was not in its outward position, and consequently he would add pressure through line 39 until the piston 42 was in its outward position.

When it is desired to remove the key 12 for some purpose, the pressure may be reduced enough to permit the springs 33 to move pistons 22 downwardly, without letting all of the fluid out of the passages in the sow block. This is done by removing the threaded plug 52 in piston 42 and permitting the escape of fluid until the upward force against the key is released. Thereafter plug 52 may be returned to its normal position, and some of the fluid will be retained within the passages.

With the novel arrangement disclosed herein, the key will withstand the terrific pounding to which it will be subjected by the drop hammer, yet will not become distorted, and can quickly be removed whenever necessary. Also, the safeguard provided by the visual indicator insures that the operator can at all times determine whether there is sufficient pressure acting against the key to securely lock the die block to the sow block.

In FIGS. 6 and 7 I have shown a modified arrangement wherein mechanical means are utilized to apply the vertical force against the key to securely lock the blocks together. In this arrangement the sow block 10', lower die block 11' and key 12', as well as other prime numbered parts are substantially identical to their unprimed counterparts in FIGS. 1 to 5, except that the sow block 10' does not have any fluid passages therein. Instead, the sow block has a horizontal passage 60 in the base thereof in which a piston or pin actuating rod 61 is movable. The passage 60 and rod 61 are generally rectangular in cross section except at one end, where the passage is enlarged and made annular as at 62, while the rod has a reduced annular end portion 63 the outer portion of which is threaded as at 64. The end of the passage is closed by a ring 65 threaded into the sow block, and through which the threaded portion of the rod can move freely. Outwardly of ring 65 a washer 66 surrounds the rod and outwardly of the washer, a nut 67 is threaded on the portion 64 of the rod. Between ring 65 and a shoulder 68 on the rod, a coil spring 69 surrounds the rod and has a normal bias tending to move the rod inwardly, which is to the right as viewed in FIG. 6.

The upper rod surface of rod 61 is provided with a plurality of slanting cam slots 71, one for each piston or pin 22', the lower arcuate cam surfaces 72 of which are adapted to ride in the slots 71. When the rod 61 is in the position shown in FIGS. 6 and 7, the pistons or pins 22' are at the upper end of slots 71 and a force is being applied upwardly against the action of springs 33' to securely lock the key and blocks together so they will withstand the drop hammering operations. To remove the upward force, the nut 67 is turned counter-clockwise for a right-hand thread and the spring 69 will move rod 61 to the right in FIG. 6, thus permitting springs 33' to urge the pistons 22' downwardly into the lower end of slots 71, whereupon the key 12' can be released. When it is desired to lock the key and blocks together again, the nut 67 is turned in a clockwise direction, thus moving rod 61 to the locking position shown in FIG. 6.

While I have shown and described two embodiments of my invention, it will be apparent that the invention is not limited to these embodiments, and that modification and changes may be made therein within the spirit of the invention and the scope of the subjoined claims.

What is claimed is:

1. In a die block holder, the combination comprising a base block having a longitudinal dovetail groove with longitudinally converging and undercut walls, one of said walls being undercut at an angle different from the other of said walls, a die block having a dovetail tongue for extension into said groove, said tongue being of lesser width than said groove and having equally tapered sides for optional face to face contact with one of said undercut walls of said base block, a key having longitudinally converging and tapered sides, one side of said key being tapered at an angle different from the other of said sides, said tapered sides adapted for wedging engagement respectively with the other of said undercut walls of said base block and one of said equally tapered sides of the tongue of said die block, a plurality of vertically movable pins mounted in said base block abutting the key at longitudinal intervals, said pins being normally resiliently

biased toward said base block, and means for simultaneously moving said pins upwardly against said key to securely lock said blocks together.

2. In a die block holder, the combination comprising a base block having a longitudinal dovetail groove with longitudinally converging and undercut walls, one of said walls being undercut at an angle different from the other of said walls, a die block having a dovetail tongue for extension into said groove, said tongue being of lesser width than said groove and having equally tapered sides for optional face to face contact with one of said undercut walls of said base block, a key having longitudinally converging and tapered sides, said tapered sides adapted for wedging engagement respectively with the other of said undercut walls of said base block and one of said equally tapered sides of the tongue of said die block, a plurality of vertically movable pins mounted in said base block abutting the key at longitudinal intervals, said pins being normally resiliently biased toward said base block, and hydraulic means for simultaneously moving said pins upwardly against said key to securely lock said blocks together.

3. In a die block holder, the combination comprising a base block having a longitudinal dovetail groove with longitudinally converging and undercut walls, one of said walls being undercut at an angle different from the other of said walls, a die block having a dovetail tongue for extension into said groove, said tongue being of lesser width than said groove and having equally tapered sides for optional face to face contact with one of said undercut walls of said base block, a key having longitudinally converging and tapered sides, said tapered sides adapted for wedging engagement respectively with the other of said undercut walls of said base block and one of said equally tapered sides of the tongue of said die block, a plurality of vertically movable pins mounted in said base block abutting the key at longitudinal intervals, said pins being normally resiliently biased toward said base block, and mechanical means for simultaneously moving said pins upwardly against said key to securely lock said blocks together.

4. In a die block holder, the combination comprising a base block having a longitudinal dovetail groove with longitudinally converging and undercut walls, one of said walls beign undercut at an angle different from the other of said walls, a die block having a dovetail tongue for extension into said groove, said tongue being of lesser width than said groove and having equally tapered sides for optional face to face contact with one of said undercut walls of said base block, a key having longitudinally converging and tapered sides, one side of said key being tapered at an angle different from the other of said sides, said tapered sides adapted for wedging engagement respectively with the other of said undercut walls of said base block and one of said equally tapered sides of the tongue of said die block, a plurality of vertically movable pins in one of said blocks abutting the key at longitudinal intervals, said pins being normally resiliently biased toward said one block, and means for simultaneously moving said pins away from said one block against said key to securely lock said key and said blocks together.

5. In a die block holder, the combination comprising a base block having a longitudinal dovetail groove with longitudinally converging and undercut walls, one of said walls being undercut at an angle different from the other of said walls, a die block having a dovetail tongue for extension into said groove, said tongue being of lesser width than said groove and having equally tapered sides for optional face to face contact with one of said undercut walls of said base block, a key having longitudinally converging and tapered sides, said tapered sides adapted for wedging engagement respectively with the other of said undercut walls of said base block and one of said equally tapered sides of the tongue of said die block, a plurality of vertically movable pins in one of said blocks abutting the key at longitudinal intervals, said pins being normally resiliently biased toward said one block, hydraulic means for simultaneously moving said pins away from said one block against said key to securely lock said key and said blocks together, said hydraulic means including a fluid conducting passage leading to said pistons, an additional piston remote from said first piston, a second fluid conducting passage leading from said first passage to said additional piston, and means cooperating with said additional piston to supplement the fluid pressure in said passages.

6. In a die block holder, the combination comprising a base block having a longitudinal dovetail groove with longitudinally converging and undercut walls, one of said walls being undercut at an angle different from the other of said walls, a die block having a dovetail tongue for extension into said groove, said tongue being of lesser width than said groove and having equally tapered sides for optional face to face contact with one of said undercut walls of said base block, a key having longitudinally converging and tapered sides, said tapered sides adapted for wedging engagement respectively with the other of said undercut walls of said base block and one of said equally tapered sides of the tongue of said die block, a plurality of vertically movable pins in one of said blocks abutting the key at longitudinal intervals, said pins being normally resiliently biased toward said one block and mechanical means for simultaneously moving said pins away from said one block against said key to securely lock said key and said blocks together, said mechanical means including a horizontally movable cam rod and cam surfaces on said rod in alignment with said pistons and being adapted to move said pistons upon movement of said rods.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,075,416 January 29, 196

Earl D. Stuhldreher

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 16, for "locikng" read -- locking --; column 3, line 12, for "41" read -- 42 --; column 4, line 36, strike out "rod", first occurrence; column 5, line 45, for "beign" read -- being --.

Signed and sealed this 24th day of December 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWIN L. REYNOLDS
Acting Commissioner of Patents