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(54) CLAMPING ARRANGEMENT

(71) We, BLACK AND DECKER INC. a corporation organized and existing under the laws of the State of Delaware, United States of America whose address is Drummond Plaza Office Park, 1423 Kirkwood Highway, Newark, Delaware 19711, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

The invention is directed to a saw blade holder with a clamping arrangement for clamping blades to the holder and is directed in particular, but not exclusively, to the saw blade holder of a power operated saw.

The clamping arrangement of power driven saws such as reciprocating saws are often disposed within a housing with the blade protruding outwardly therefrom. It is especially advantageous to be able to interchange blades quickly when the reciprocating saw is at a job site as valuable labour time can be saved if saw blades can be interchanged rapidly. It is desirable too that the saw blade be as strong as possible at the location of the clamping arrangement; considerable strength, cost and reliability advantages are also afforded if the seating surface for the blade, which constitutes part of the clamping arrangement can be comparatively easily formed and integral with the blade holder.

The present invention provides a saw blade holder including a clamp arrangement for clamping blades to the holder, the holder being of tubular form and the arrangement comprising:

surface means formed on an end portion of the blade holder for receiving the saw blade thereon; said end portion being defined by a cut-away section of said tubular member, said cut-away section defining two

spaced apart cut wall portions of the tubular saw-blade holder, said cut wall portions being said surface means and extending in the longitudinal direction of the saw-blade holder;

a collar surrounding said end portion of the blade holder; and

securing means threadably engaging said collar for pressing a saw blade against said surface means, and said end portion against the inside wall of said collar, the shape of the inner wall of said collar corresponding to the shape of the outer wall of said end portion in the region of said pressure thereby causing said inner wall of said collar to support said end portion.

The securing means may be an annular member defining a clear passage there-through for facilitating access to the shank portion of a saw blade held between said securing means and said surface means whereby said shank portion can be removed from between said securing means and said surface means with aid of an instrument passed through said clear passage in the event of a saw blade breaking off at the shank.

A clamping plate can be located in the collar and interposed, in use, between the securing means and a saw blade to be clamped. When the securing means is provided with a clear-through passage, the clamping plate is preferably also provided with an opening which is substantially in line with this passage thereby permitting the operator to get access to the shank portion with a long thin instrument for removing the shank should the blade be broken off at the shank.

A saw blade holder in accordance with the invention may be utilized in a reciprocating power saw having a housing arranged in surrounding relation to the saw-blade holder. In such a combination access means is preferably formed in the wall of the

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housing at the immediate vicinity of the securing means of the clamp arrangement thereby facilitating access through the housing to the securing means. If the securing means is provided with a clear-through passage and the clamping plate (when present) is also provided with an opening, then access can be had to the shank portion of the saw blade from outside the housing of the power driven saw.

A saw blade holder according to the invention finds application for example in portable electric power tools such the Cut-Saw all purpose reciprocating saw manufactured and sold by The Black and Decker Manufacturing Company, Towson, Maryland 21204.

By way of example a saw blade holder embodying the invention will now be described with reference to the accompanying drawing, in which:

FIG. 1 is a perspective view of a power driven reciprocating saw wherein a clamping arrangement of the saw blade holder is located within the housing;

FIG. 2A illustrates a prior art saw blade holder with clamping arrangement which has been utilized in reciprocating saws;

FIG. 2B is an exploded view of the saw blade holder with clamping arrangement of FIG. 2A taken along line II-II;

FIG. 2C is a longitudinal exploded view of the saw blade holder with clamping arrangement of FIG. 2A;

FIG. 3 is an exploded view of a saw blade holder, with clamping arrangement, embodying the invention and,

FIG. 4 is an elevation view showing the saw blade holder, with clamping arrangement, embodying the invention mounted within the housing of a reciprocating power driven saw.

FIG. 1 illustrates a reciprocating saw 1 wherein the clamping arrangement of a saw blade holder is disposed inside the housing of the saw. A window 2 is formed in the housing 5 of the saw. Reference numeral 4 designates a shoe which is mounted at the cutting end of the saw and reference numeral 3 designates the saw blade.

FIG. 2A to 2C illustrate a prior art clamping arrangement for a saw-blade holder which is made of cylindrical solid bar stock 6 with two flat surfaces 7 and 8 machined on the end portion 9. A clamping plate 11 is provided having a hole 12 formed therein as well as a small projection 13 formed thereon. The saw blade 3 is clamped between the end-portion 9 and clamping plate 11 and secured in place with the aid of the projection 13 which is accommodated in hole 10 of the saw blade. The bolt 14 and nut 15 secure the saw blade to the end-portion 9 in combination with the plate 7. The projection 13 is received in opening 10

in the saw blade 3 and helps stabilize and position the blade. The raised portion 16 aids in guiding the blade shank 17 into the clamping arrangement. The saw blade 3 is tightened in place by passing an allen wrench through the window 2 of the housing 5 of the reciprocating saw 1 and tightening the bolt 14.

Experience has shown that the above described prior art clamping arrangement has provided considerable difficulty to the operator of the tool and provides unsatisfactory clamping performance because the saw blades tend to work loose during operation of the reciprocating saw.

Since the clamping arrangement is disposed within the housing 5 of the reciprocating power saw 1, it is somewhat difficult to position the blade 3 when it is inserted by the operator from the front end of the power saw because difficulty is experienced in getting the projection 13 to line up with the hole 10 in the saw-blade shank 17. In addition, there is the problem of removing a shank portion should the saw blade break off at the shank. Through the window 2 no access is provided by means of which the operator can get at the shank portion because the clamping plate 11 and bolt 14 are in the way. If one would remove the bolt 14, of course access would be had to the shank portion 17; however, it would be rather difficult to get the nut 15 back on the bolt 14 from the front end of the saw. About the only practical way of getting the broken shank portion 17 out of the housing 5 is either shaking it loose or removing it with the aid of, say, a pair of needle-nose pliers.

Difficulty is also encountered when removing a worn but unbroken saw blade because a wax-like rust preventative coating which is usually applied to the blades tends to cause the shank portion to stick to the clamp plate 11 after the latter is loosened making it difficult to disengage the projection 13 from the hole 10 in the shank portion 17 of the blade 3.

A disadvantage is also encountered when a replacement blade is inserted because the bolt 14 limits the depth to which the shank of the saw blade can be inserted and hence the length of the shank which can be clamped.

In addition, there are manufacturing difficulties because the end-portion 9 of the stock bar constituting the reciprocating shaft 6 must be specially machined and heat treated. The machining weakens the end-portion 9 of the saw-blade holder 6 as well as makes necessary expensive additional machining steps to form the flat portions 7 and 8 on the end portion 9 as well as the holes therein for projection 13 and bolt 14.

Referring now to FIG. 3, the saw blade holder 19 embodying the invention is of

tubular form with a cut-away end portion 18 and is suitable for use in a reciprocating power saw. The two spaced-apart cut wall surfaces 20 defined by the cut-away portion 18, constitute surface means extending in the longitudinal direction of the holder for receiving the shank portion 17 of the saw blade 3 thereon. A collar 21 fits over the end portion 18 and is held thereon with the aid of pin 22 which is accommodated in a pin hole 23 of the end portion 18 so that the collar 21 is loosely held on the end portion 18.

Securing means in the form of a threaded member 24 threadably engages the collar 21 at opening 25 therein. The threaded member can be tightened against the saw-blade shank portion 17 to hold the same tightly in the clamp. However, it is preferable to interpose a clamping plate 26 which is over the shank portion 17. The plate 26 is trapped with the aid of bent portion 27 thereof in the collar 21 so as to be loosely held therein when the blade is not clamped. The plate 26 cannot be removed unless the collar 21 and pin 22 are first removed. Because the plate 26 is trapped in this manner, it will not fall out of the tool when the securing means 24 is loosened for exchanging blades.

The clamping plate 26 is coextensive with the spaced-apart cut wall surfaces 20 and distributes the clamping force from the set screw 24 to the longitudinally outward portions of the blade shank 17; these outward portions are shown shaded in FIG. 3 and are designated by reference numeral 35. In this way, the blade is held at its edge portions 35 on both sides thereof between the clamping plate 26 and the cut-away wall portions 20 of the saw-blade holder. Loading the blade shank 17 at the edge portions 35 thereof ensures that the blade will be held securely and tightly against the cut-wall portions 20.

In contrast, the prior art clamping arrangement according to FIGS. 2A to 2C is configured such that the shank portion of the blade is held between two flat surfaces, namely: the flat surface 8 on end-portion 9 and the inside surface of the clamp 7. If it were not for the projecting portion 13 on the inside surface 28 of plate 11 in engagement with the opening 10 in the saw-blade shank, the blade would tend to shift positions.

Referring again to FIG. 3, it is noted that the clamping space between the clamping plate 26 and the cut-away wall portions 20 is completely clear the entire distance back to the transverse wall 29 of the saw-blade holder 19. This greatly facilitates insertion of a replacement saw blade since the blade shank can be inserted to abut against the wall 29 thereby locating the blade in the clamp. A further advantage is that the end

portion 18 is an integral part of the reciprocating shaft 19 and therefore affords very substantial strength and reliability at the end portion where the blade is clamped.

Further, the seating surface for the blade shank 17 is easily formed by merely cutting away a longitudinal portion of the tubular stock from which the saw-blade holder 19 is made. On the other hand, the prior art clamping arrangement of the type shown in FIGS. 2A to 2C requires an end portion which must be specially shaped to provide a flat portion 7 for the nut 11 as well as the flat portion 8 for accommodating the blade shank 17 thereon. The clamping plate 26 and the cut-away wall portions 20 can both be made sufficiently long so that they mutually hold the saw blade also at a location beyond the shank portion (i.e. at the cutting portion of the blade) where the saw blade has a greater cross-section. At this location the blade has a greater resistance to bending thereby reducing the tendency for the blade to break.

The securing means can be a threaded annular member such as a hollow set screw 24 provided with a clear-through passage 30. The clamping plate can also be provided with an opening 31 substantially in line with the passage 30. The hollow set screw 24 then presses against the plate 26 about the periphery of this opening 31 thereby, in turn, sandwiching the shank portion 17 between end-portion 18 and clamping plate 26. The set screw 24 is provided with a hexagonal opening for accommodating an allen wrench whereby the set screw can be tightened against the plate 26. When the blade 3 is clamped, the end portion 18 of the shaft 19 is held tightly against the correspondingly-shaped inside wall surface 32 of collar 21. Also, it should be noted that the application of the load pressure of the set screw 24 about the periphery of opening 31 distributes this pressure load on the plate 26 so that not all of this load is applied at the weakest cross-section thereof, namely, on a transverse line through the diameter of the opening 31.

FIG. 4 illustrates the holder and clamping arrangement of FIG. 3 - utilized in a reciprocating power driven saw. A housing 5 is arranged in surrounding relation to the saw-blade holder 19. A window 2 is formed in the housing 5 of the saw at a location adjacent to the clamp arrangement. Should it be necessary to change a saw blade, the operator merely inserts an allen wrench into the set screw 18 and loosens the set screw 24 so that the saw blade 3 can be withdrawn. However, should it happen that the saw blade is broken at the shank 17, say along line 33, the operator merely inserts a pointed instrument such as an awl 34, for example, through opening 2 in the housing

and then through the passage 30 and the opening 31 in the set screw 24 and plate 26, respectively. The operator then merely pushes the shank portion 17 out from between the clamping plate 26 and cut-wall portions 20.

It will be seen that the embodiment of the invention described has a saw blade holder with an improved and more reliable clamping arrangement for clamping saw blades to the holder. The arrangement facilitates the rapid interchange of saw blades and also enables a shank portion of a broken saw blade to be easily removed even though the clamping arrangement is located within the housing of a power driven saw. Furthermore it will be seen that the clamping arrangement requires only slight modification of the saw blade holder to obtain a seat for the saw blade shank.

The saw blade holder described above with reference to Figs. 3 and 4 is also described in Application No. 50075/77 (Serial No. 1597239) which claims a saw blade holder including a clamp arrangement for clamping blades to the blade holder, the arrangement comprising:

surface means formed on an end portion of the blade holder for receiving the saw blade thereon, said surface means extending in the longitudinal direction of the holder;

a collar surrounding said end portion of the blade holder; and,

securing means engaging said collar for pressing a saw blade against said surface means, and said end portion against the inside wall surface of said collar thereby to press the blade tightly between said securing means and said surface means; said securing means being an annular member defining a clear passage therethrough for facilitating access to the shank portion of a saw blade held between said securing means and said surface means whereby said shank portion can be removed from between said securing means and said surface means with the aid of an instrument passed through said clear passage in the event of a saw blade breaking off at the shank.

WHAT WE CLAIM IS:

1. A saw blade holder including a clamp arrangement for clamping blades to the holder, the holder being of tubular form and the arrangement comprising:

surface means formed on an end portion of the blade holder for receiving the saw blade thereon; said end portion being defined by a cut-away section of said tubular member, said cut-away section defining two spaced apart cut wall portions of the tubular saw-blade holder, said cut wall portions being said surface means and extending in the longitudinal direction of the saw-blade holder;

a collar surrounding said end portion of

the blade holder; and

securing means threadably engaging said collar for pressing a saw blade against said surface means, and said end portion against the inside wall of said collar, the shape of the inner wall of said collar corresponding to the shape of the outer wall of said end portion in the region of said pressure thereby causing said inner wall of said collar to support said end portion.

2. A holder as claimed in claim 1, further including a clamping plate located in the collar and interposed, in use, between the securing means and a saw blade to be clamped.

3. A holder as claimed in claim 2, in which said clamping plate is coextensive with said spaced apart cut wall portions.

4. A holder as claimed in any one of the preceding claims, including means for holding said collar on said end portion.

5. A holder as claimed in claim 2, including ancillary means for loosely holding said clamping plate within said collar.

6. A holder as claimed in claim 2, in which said securing means is an annular member defining a clear passage there-through; said plate having an opening formed therein substantially in line with said passage thereby facilitating access to the shank portion of a saw blade held between said clamping plate and said surface means whereby said shank portion can be removed from between said clamping plate and surface means with aid of an instrument passed through said clear passage and said opening in said plate in the event of a saw blade breaking off at the shank.

7. A holder as claimed in claim 1, in which said securing means is an annular member defining a clear passage there-through for facilitating access to the shank portion of a saw blade held between said securing means and said surface means whereby said shank portion can be removed from between said securing means and said surface means with aid of an instrument passed through said clear passage in the event of a saw blade breaking off at the shank.

8. A holder as claimed in claim 2, for a saw blade having a cutting portion which extends beyond the shank portion of the saw blade and has a greater cross-section area than the shank portion, wherein said clamping plate and said surface means have respective lengths greater than the shank portion of the saw blade whereby said clamping plate and said surface means coact to clamp the saw blade also at the cutting portion thereof.

9. A power driven saw including a saw blade holder as claimed in any preceding claim.

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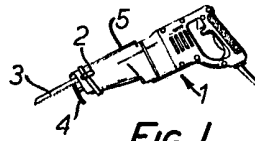


Fig. 1.

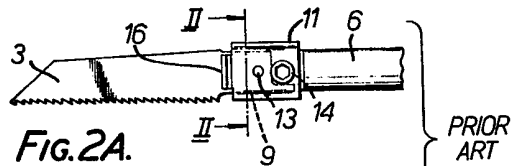


Fig. 2A.

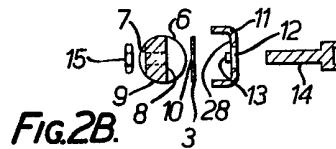


Fig. 2B.

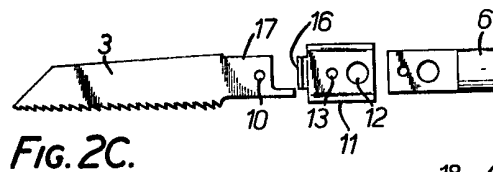


Fig. 2C.

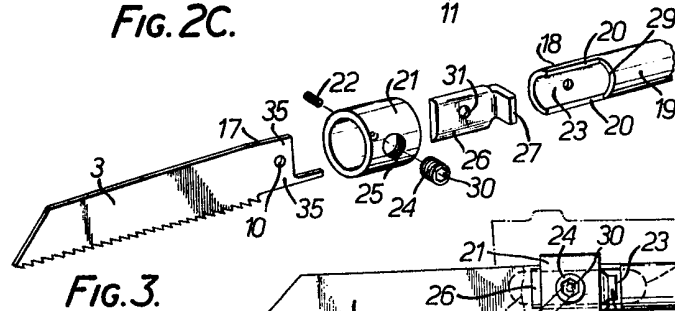


Fig. 3.

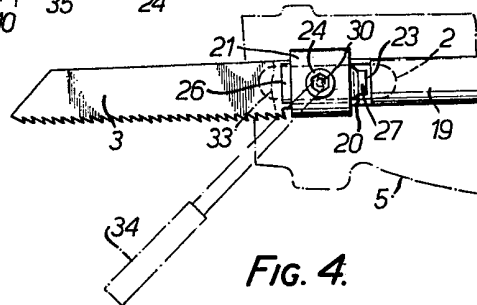


Fig. 4.