

PATENT SPECIFICATION

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(54) CLAMP NAIL

(71) We, SENCO PRODUCTS INC a Corporation organised under the laws of the State of Ohio, United States of America, of 8485 Broadwell Road, Cincinnati, Ohio 45244, 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 present invention relates to clamp nails suitable for joining two wood members tightly together by driving the nail endwise into the two members across the joint therebetween.

When it is desired to fasten two pieces of wood together in a butt joint, whether it be a right angle joint or a mitre joint and where it is desired that the two pieces be tightly clamped together, use has frequently been made of a so-called clamp nail. Such clamp nails have generally been in the form of a channel and they have been designed to be driven into the two butted pieces of wood across the joint. Thus, as the nail is driven into the wood, the flanges of the channel hold the two pieces of wood together into a tight relationship. Many such prior art clamp nails require a prior saw cut for their proper installation.

Joints produced with a clamp nail in the form of a tapered channel have been found to be tighter at the trailing end of the fastener than at the leading end of the fastener. Such joints often appear well clamped when viewed from the direction the fastener was inserted. However, when the joint is turned over, it could be seen that the joint is not really well clamped.

It has been found that in order to avoid splitting of the wood into which the clamp nails are driven it is necessary to provide holes in the web to provide a space into which some of the displaced wood may move and thereby avoid a tendency to split-

ting. The expansion of the grain of the wood displaced during the driving of the fastener relieves a substantial amount of the stress caused in the material by the insertion of the fastener and thereby reduces the chances of failure of the joint by splitting.

According to one feature of the present invention, the areas of the holes in the back of the fastener must represent at least 30% of the area of the back of the fastener in order to be effective for the purpose intended. A single hole of this magnitude in the back of the fastener would impair the structural integrity of the fastener and as a result the leading edge of the fastener would cripple during insertion and thereby produce a poor joint. In the present invention, the minimum 30% area of holes in the back of the fastener is achieved in a way which provides for a central axial column extending all the way from the leading to the trailing end of the fastener. Thus, there must be at least two holes, or a larger number of holes totalling at least 30% but disposed in such a way as to leave said central column.

Thus the present invention provides a clamp nail comprising a channel-shaped member having a web and marginal flanges extending in the same direction therefrom, said web being of substantially constant width over the major portion of its length and having a tapered portion which is short relative to the overall length of the nail and which is widest at its leading end in the direction of driving of the nail in use thereof, said marginal flanges extending along substantially the full length of the nail, said tapered portion converging from its wide end to its rear end at which it runs into said major portion, the web having at least two transversely spaced apertures of substantially equal size disposed symmetrically on opposite sides of the longitudinal axis of the nail, said apertures bounding either side of a central column of the web extending along

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said longitudinal axis, said central column having a sufficient width for contributing to the structural strength of the nail in the direction of driving, and said apertures having a total area equal to at least 30% of the total web area.

5 The parallel flanges extending over the major portion of the length of the clamp nail provide a substantially uniform clamping action of the wood at the joint which is being fastened. The tapered portion may commence at the leading end of the clamp nail in the direction of driving or alternatively the web may have a forward portion which is short relative to the overall length of the nail at the end of the nail which leads in the direction of driving, said forward portion having a substantially constant width greater than that of the major portion and having parallel upstanding flanges, said tapered portion connecting said forward portion with said major portion.

10 Preferably the clamp nail has sharp leading edges on said web and flanges at the leading end of the nail in the direction of driving, which leading edges extend from a thickness of from 10% to 20% of the thickness of said web and flanges to the full thickness of the web and flanges. Conveniently the sharp leading edges each include an angle of 60°.

15 Another problem which has arisen in the past is where clamp nails are desired to be assembled into a stick suitable for use in a nailing machine having a magazine designed to accept a stick of such clamp nails. If the clamp nails are not precisely uniform in their dimensions and a plurality of such nails are stacked together, there will be a tendency for the stick to curve, and not be perfectly straight. This may now be overcome by providing the upstanding flanges at their free ends remote from the web, with stacking ledges which can be produced during the manufacturing process by a coining operation and which extend into the inwardly disposed flange corners so that the bottoms of the ledges are spaced uniformly from the back of the nail. By this means a stick of nails may be assembled with the back of one nail resting on the ledges of an adjacent nail to produce a substantially straight stick which may be used in a magazine-type nailing machine.

20 The following is a description by way of example of some preferred embodiments of the invention illustrated with reference to the accompanying drawings in which:-

25 Figure 1 is a perspective view of a preferred clamp nail according to the invention;

30 Figure 2 is a perspective view of a second, basic, clamp nail;

35 Figure 3 is a perspective view similar to Figure 1 showing a third clamp nail produced from a rectangular blank;

40 Figure 4 is a greatly enlarged fragmentary plan view of a corner of the leading edge of any of Figures 1, 2 or 3;

45 Figure 5 is a cross-sectional view of a fourth clamp nail taken on the line 5-5 of Figure 6;

50 Figure 6 is a plan view of said fourth clamp nail;

55 Figure 7 is a side elevation of the nail of Figure 6;

60 Figure 8 shows a modified form of the clamp nail of Figure 1 in position in a joint;

65 Figure 9 is a plan view of a fragment of a stick of clamp nails according to the invention; and

70 Figure 10 is an elevational view of the stick of Figure 9.

75 The broad concept of the present invention in its simplest form is shown in Figure 2. The clamp nail of Figure 2 has a web 10 which has upstanding parallel flanges 11, these flanges 11 being parallel over a major portion of the length of the clamp nail. Towards the leading end of the nail i.e. the end which leads in the direction of driving, the web 10 flares outwardly and widens in a tapered portion 12 (which is short relative to the overall length of the nail) with upstanding flanges 13 converging towards the flanges 11 and merging into them. The tapered portion 12 of the clamp nail of Figure 2 commences at the leading end of the clamp nail in the direction of driving of the nail in use thereof. During driving, the flanges 13 of the tapered portion 12 serve to draw the members to be joined tightly together. When fully driven home, the parallel flanges 11 maintain a uniform clamping action across the joint.

80 In Figure 1 an additional feature is shown. In the Figures the same parts will be designated by the same reference numerals. Thus, in Figure 1 the major rectangular portion of the web is indicated at 10 and the parallel upstanding flanges extending over a major portion of the length of the clamp nail are indicated at 11, the tapered web portion and the flanges thereof at 12 and 13, respectively. In the embodiment of Figure 1, however, there is a forward portion, which is short relative to the overall length of the nail, again comprising parallel upstanding forward flanges 14 extending from a forward web portion 15 which has parallel sides but is wider than the major web portion 10 on the other side of the tapered portion connecting it thereto.

85 Referring again to the description of the leading end of the clamp nail in Figure 1 it may be pointed out that this configuration works well in soft woods. However, in hard woods there is a tendency for the flanges 13 and 11 to deflect outwardly or to be partially folded outwardly and downwardly which greatly reduces the clamping efficiency of

the fastener. Therefore in hard woods it is desirable to use the configuration of Figures 1 and 3. The short forward portion with the parallel flanges 14 substantially reduces the tendency of the flanges on each side to deflect outwardly. In other words, the forward flanges 14 support the tapered portion flanges 13 as the clamp nail is driven into the material.

It should be noted that in the embodiment of Figure 1 all the flanges 11, 13 and 14 are all of the same height. Referring now to Figure 3, there is shown a commercially preferred embodiment wherein the clamp nail has been made from a rectangular blank. When a rectangular blank is used the tapered portion flanges 13a (corresponding to the flanges 13) and the forward portion flanges 14a (corresponding to the flanges 14) become lower in height because of the widened web portions 12 and 15. In the embodiment of Figure 3 there is also illustrated a stacking ledge 11a which will be described in more detail in connection with Figures 5, 9 and 10.

It will be noted that the leading edges in the direction of driving in all embodiments are sharpened somewhat. This is illustrated in the fragmentary enlarged elevational view of Figure 4. As shown in This Figure, the leading edge is tapered down to a width 14b which is between about 10% and about 20% of the thickness of the material of the clamp nail. The included angle A of the sharp leading edge is preferably about 60°.

All the nails of the Figures thus far described have apertures 16. The total area of these apertures 16 should be at least 30% of the total area of all the web portions 10 and 12 or 10, 12 and 15 of the respective clamp nail and there should be at least two apertures 16 so as to leave between them a central column 17 extending longitudinally through the clamp nail to provide adequate structural strength during driving. Figure 3 also illustrates a slight bow in the web 10, 12 and 15 and this is better illustrated in Figure 5. The object of the bow is to bring the central column 17 towards the centre of the flange height and thereby to bring the column and a greater portion of the web 10 under the driver in a nailing machine.

With respect to Figure 4, it should be pointed out that the sharp edge there shown is a compromise one. A very sharp edge works better in soft woods while a fastener with no sharpening of the leading edge works very well in hard dense materials. The sharp edge described above and shown in Figure 4 works satisfactorily in both hard and soft wood.

Referring particularly to Figure 5, it will be noted that there is a small indentation or stacking ledge indicated at 11a along the inner corners of the free edges of both of the

flanges 11. The ledges 11a are formed in a coining operation during formation of the clamp nail itself, so that the distance X from the bottom of the ledge 11a to the back of the clamp nail will always be constant. It is extremely difficult in practice to form the clamp nail so that the free top edges of the straight parallel flanges 11 are equidistant from the back of the fastener. If these edges are not strictly equidistant from the back of the fastener, it is obvious that one side of the resulting strip of fasteners when stacked together will be longer than the other and the strip will curve rather than be straight. Under these conditions it cannot very well be used in a straight magazine of a nailing machine.

However, since the ledges 11a are produced in a coining operation at the same time that the fastener is formed, the distance X shown in Figure 5 will always be the same and when a plurality of clamp nails are stacked together as shown in Figures 9 and 10, they will be straight and can easily be used in a magazine of a nailing machine. When a plurality of clamp nails are assembled in a stick as shown in Figures 9 and 10, they may be held in assembled relation by means of a band of a suitable tape along the leading and trailing ends of the fasteners. Such tapes are indicated at 18 and 19. One or both of the tapes may of course be imprinted with indicia such as an arrow 20 (Figure 9) to indicate a proper direction of insertion into a magazine.

While it will not show in the drawings, the clamp nail is preferably punched from the sheet metal such that the grain of the rolled sheet material from which it is manufactured runs perpendicular to the direction in which the fastener is to be driven. This particular grain orientation makes it possible to form the fastener with smaller bend radii in the corners without cracking the material at the bends. The ultimate tensile strength of the material and correspondingly the fastener is of the order of 10% higher than if the material grain were parallel with the direction in which the fastener is to be driven.

In Figure 8 there is shown a joint between two pieces of wood indicated at 21 and 22 and this figure simply shows the position of the clamp nail when driven into the joint. In actual practice, a clamp nail of the present invention having a length greater than 50% of the thickness of the wood being joined will produce a very tight joint and the joint will be tight when viewed from both sides.

It will be understood that minor modifications may be made without departing from the scope of the invention, as defined in the appended claims. No limitation which is not specifically set forth in the claims is intended and so such limitation should be implied.

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WHAT WE CLAIM IS:-

1. A clamp nail comprising a channel-shaped member having a web and marginal flanges extending in the same direction therefrom, said web being of substantially constant width over the major portion of its length and having a tapered portion which is short relative to the overall length of the nail and which is widest at its leading end in the direction of driving of the nail in use thereof, said marginal flanges extending along substantially the full length of the nail, said tapered portion converging from its wide end to its rear end at which it runs into said major portion, the web having at least two transversely spaced apertures of substantially equal size disposed symmetrically on opposite sides of the longitudinal axis of the nail, said apertures bounding either side of a central column of the web extending along said longitudinal axis, said central column having a sufficient width for contributing to the structural strength of the nail in the direction of driving, and said apertures having a total area equal to at least 30% of the total web area.

2. A clamp nail as claimed in claim 1, wherein said tapered portion extends from the end of the clamp nail which leads in the direction of driving.

3. A clamp nail as claimed in claim 1, wherein the web has a forward portion which is short relative to the overall length of the nail, at the end of the nail which leads in the direction of driving, said forward portion having a substantially constant width greater than that of the major portion and having parallel upstanding flanges, said tapered portion connecting said forward portion with said major portion.

4. A clamp nail as claimed in any of the preceding claims wherein said web is provided with a single bow extending inwardly

in the direction of said flanges substantially from one flange to the other, to bring said column more nearly to the centre of the flange height.

5. A clamp nail as claimed in any of claims 1 to 4 wherein the inner corners of the free edges of the flanges of the major web portion have stacking ledges, the bottoms of which ledges are at a predetermined spacing from the back of the nail, whereby a number of said nails may be assembled into a straight stick.

6. A stick of clamp nails for use in a nailing machine having a magazine for accepting such a stick, said stick comprising a plurality of clamp nails according to claim 5 stacked so that adjacent nails have the back of one nail engaging the stacking ledges of an adjacent nail, and means holding the nails of said stick in stacked relation.

7. A stick of clamp nails as claimed in claim 6 which is provided with indicia indicating the correct direction of insertion of the stick into said magazine.

8. A clamp nail according to claim 1 substantially as described hereinbefore with particular reference to any of Figures 1, 2 and 3, with Figure 4 of the accompanying drawings.

9. A clamp nail according to claim 1 substantially as described hereinbefore with particular reference to Figures 8 to 10 or to Figures 3 to 10.

10. A stick of clamp nails according to claim 6 substantially as described hereinbefore with particular reference to Figures 9 and 10 and Figure 8 or Figures 3 to 7 of the accompanying drawings.

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