APPARATUS AND METHOD FOR MANUFACTURING OFFSET HEAD NAILS

Inventors: Donald B. Halstead, Huntington Beach, CA (US); Julio C. Vargas, Fontana, CA (US)

Correspondence Address:
CHRISTIE, PARKER & HALE, LLP
350 WEST COLORADO BOULEVARD SUITE 500
PASADENA, CA 91105 (US)

Appl. No.: 09/974,657
Filed: Oct. 11, 2001

Related U.S. Application Data
Non-provisional application No. 60/244,532, filed on Oct. 31, 2000.

Publication Classification
Int. Cl. 7 B21G 3/00
U.S. Cl. 470/129

ABSTRACT
A method and apparatus for forming a circular offset head nail including first and second die-rings having a plurality of grooves for holding nail blanks. A pre-bender adjacent the head forming roller bends an end of the nail blanks so that a head forming roller adjacent the pre-bender rolls the circular offset heads in a free-flow form. The pre-bender and the head forming roller include an angled surface for forming the circular offset head.
APPARATUS AND METHOD FOR MANUFACTURING OFFSET HEAD NAILS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from U.S. Provisional Application No. 60/244,532 filed Oct. 31, 2000.

FIELD OF THE INVENTION

[0002] The present invention relates to nails, and more particularly to an apparatus and method for manufacturing offset head nails by pre-bending the nail wire and forming the offset round head on a head roller. The head is formed by the nail head roller in a free-flow form.

BACKGROUND OF THE INVENTION

[0003] Nails used in power operated nailing applicators are preferably formed into strips, being joined together by glue, formed plastic, adhesive strips or wires welded to the shanks. It is desirable that the strips have a predetermined length suitable for the nailing gun. It is further desirable that the strip contain as many nails as possible within a given length. This reduces the down time involved when reloading the nail gun magazine with a new strip of collated nails.

[0004] The collated nails in the strip are arranged with the nails heads overlapping one another. The nails are offset with their heads one above the other. With a strip formed of conventional round-headed nails having circular heads with the head center coaxial with the nail shank, the edge of the head of one nail will interfere with the shank of the next adjacent nail, causing the nails in the strip to be spaced undesirably far apart. This spacing increases the difficulty of joining the nails together in the strip and reduces the number of nails that can be accommodated in a predetermined length strip.

[0005] To maximize the number of nails within a given strip, nails have previously been made with D-shaped heads. This design allows the nail shanks to lie against one another with the heads overlapping one another, but without interfering with the shanks. This solution maximizes the number of nails in a given strip, however reduces the surface area of the head which can lead to an inability of the nail head to resist penetration into a work piece and less holding power for the nail.

[0006] To address this problem, completely circular offset headed nails have been produced so that the periphery of the head at one point is substantially tangential to an edge surface of the shank. However, the manufacture of such designs is complicated and expensive through the use of a complex punch and die arrangement. Manufacturing a round offset-headed nail through the use of a punch and die is also time consuming because each head is formed through a separate punching operation. Consequently, a need exists for a new method and apparatus for forming circular offset head nails which is more efficient and economical.

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention is a method and apparatus for forming circular offset head nails to be collated. The apparatus is based on a rotary machine operation wherein the nail wire is straightened and a nail point and the head are formed in one continuous operation. The wire is pulled through a straightener by two feed rollers and pushed forward to a cutting wheel. The wire is cut into blanks and the nail point formed in one operation. The separate nail blanks are then carried forward by a number of die feed rollers until the blanks are stopped by an insertion stop. While placed in a position between the die feed rollers and the insertion stop, each separate nail blank is caught by carriers on a rotating die-ring. Initially the nail blank is pressed against the carrier due to the die-ring rotation. Then a gripping pin presses the blank lightly against the carrier.

[0008] The blank then passes a positioning roller and is pushed back slightly to ensure the exact amount of material for the formation of the head. The carriers place the nail blanks exactly in line with grooves in the die-ring. The dies in the die-ring operate in pairs, with 30 or 40 dies fixed in a first ring and 30 or 40 in a second ring. The two rings are placed at an angle to each other thereby allowing the die pairs to be open at the upper portion of rotation and closed at the lower portion of rotation.

[0009] At the lower position of rotation of the die-rings, the protruding ends of the nail blanks pass a nail head roller and are rolled into the nail heads. The finished nails drop out of the open dies before they reach the top position of rotation and into a discharge chute which carries them to a container for a further collating operation.

[0010] The circular head is formed in an offset position with respect to the shaft of the nail by prior to entering the head roller, passing a pre-bender which slightly bends the end of the shaft. The head roller then rolls the head in an offset configuration. The pre-bender and the head roller are specifically shaped so that the head is formed on a flat surface of the head roller in a free-flow form requiring no female dies or pockets to form the outside of the nail head. Consequently, the offset head nails can be formed efficiently and inexpensively in a continuous manner by pre-bending and rolling the heads.

[0011] These and other advantages of the present invention can be seen from the details description and claims as hereinafter disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a perspective view of a nailing strip in accordance with the present invention;

[0013] FIG. 2 is a side schematic view of the apparatus for making the nails of FIG. 1;

[0014] FIG. 3A is a top schematic detail view of the die rollers of the apparatus of FIG. 2;

[0015] FIG. 3B is a side schematic view of the die rollers of FIG. 3A;

[0016] FIG. 4 is a side schematic detail view of the pre-bender of the apparatus of FIG. 2; and

[0017] FIG. 5 is a side schematic detail view of the head roller of the apparatus of FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0018] As shown in FIG. 1, the present invention is directed to the manufacture of circular offset head nails 10...
adapted to be collated into a nailing strip 12. In this strip, the nail shanks 14 lie close to one another with the nails heads 16 overlapping one another. The collated nail strip 12 includes a plurality of nails 10 held together by any suitable medium. This may be seen as an adhesive material 18 formed in a strip or strips bonded to the side of the nails. Other forms of medium include adhesive or plastic strips molded around nails, tape, hot melt adhesives, or wires welded to the nails. As is well known, it is desirable to collate the nails as closely as possible together to one another in the strip so that a maximum number of nails can be achieved. This enables the nailing gun to be used over longer periods of time before requiring the strips to be reloaded. As with all nails, opposite the head on the Shank is located a tip 20. The head is positioned on the Shank so that the axis of the head is offset from the axis of the Shank. A circumferential edge portion of the head closest to an edge portion of the Shank overhangs the Shank by approximately 0.025 inches to about 0.035 inches.

[0019] Referring to FIG. 2, the nails 10 are manufactured on a nailing machine 30. The nailing machine 30 is based on a rotary machine operation, such as a nail making machine commercially available from Enkotec. Initially nail wire 32 is straightened by being pulled through straightening rollers 34 by two feed rollers 36. Feed rollers 36 also push the wire forward towards cutting units 38. Each cutting unit includes six cutters 40 uniformly spaced around the perimeter of the cutting unit. Each cutter 40 cuts the nail wire into nail blanks while simultaneously forming the nail point. The separate nail blanks are carried forward by a number of die feed rollers 42 until the blanks are stopped by an insertion stop 44.

[0020] While placed in a position between the die feed rollers 42 and the insertion stop 44, each separate nail blank is caught by carriers 46 on a first rotating die-ring 48. Initially the nail blanks are pressed against the carrier due to rotation of the first die-ring 48. A gripping pin 50 then presses the blank against the carrier until the blanks are repositioned by a positioning roller 52, which positions the blanks at the proper location to ensure the exact amount of material available for the formation of the head.

[0021] As seen in FIGS. 3A and 3B, the carriers place each nail blank 54 exactly in line with a groove 56 in the first rotating die-ring 48 and a groove 58 in a second rotating die-ring 60. Die-ring 48 and die-ring 60 operate in pairs with 30 grooves fixed in each ring. First die-ring 48 and second die-ring 60 are placed at an angle to each other. Thus, the die pairs are open at an upper location during a revolution and closed at the lower position of the die-ring rotation.

[0022] As seen best in FIG. 2, at the lower positions of the die-ring rotation, the protruding ends of the nail blanks 54 pass a nail head roller 62 and the heads are rolled onto the blanks. The finished nails drop out of the open grooves in the die-rings before the die-rings reach their top position. The nails fall down onto a discharge chute 64, which carries them out into a nail container for a subsequent collating operation.

[0023] As shown in FIGS. 4 and 5, the offset round head is formed by the use of a pre-bender 66 positioned adjacent the positioning roller 52. The pre-bender slightly bonds the ends of the nail shank so that there is enough metal to form the head in an offset location with respect to the shaft of the nail. The shape of the pre-bender is different from that used in forming D-head nails in that the pre-bender has been modified to include two angled surfaces 68 and 70 on either side of the pre-bender. Secondly, the head forming roller 62 has been modified to include an angled surface 72. The nail heads are then formed by pre-bending the end of the nail blanks and forming the offset round head on the modified head roller. The head is formed on a flat surface 74 of the nail head roller in a free-flow form requiring no dies or pockets to form the outside of the nail head. The completely manufactured offset head nails are then collated in any suitable collating operation known in the industry.

[0024] While the present invention has been disclosed with respect to an apparatus and method for forming a circular offset head collated nail, it is to be understood that changes and modifications can be made therein within the full intended scope of the invention as hereinafter claimed. What is claimed is:

1. A nail making apparatus for forming a circular offset head nail comprising:
   a first die-ring having a plurality of grooves for holding a first side of a nail blank;
   a second die-ring having a plurality of grooves for holding a second side of the nail blank;
   a head forming roller adjacent the first and second die-rings; and
   a pre-bender adjacent the head forming roller,
   wherein the pre-bender and head forming roller are shaped to form the circular offset head in a free-flow form.

2. The apparatus of claim 1 wherein the pre-bender and the head forming roller are shaped to include an angled surface.

3. The apparatus of claim 1 further comprising:
   first feed rollers for drawing nail wire through straightening rollers and into cutting wheels to form the nail blanks; and
   second feed rollers for moving the nail blanks to the first and second die-rings.

4. The apparatus of claim 1 wherein the cutting wheels include a plurality of cutters.

5. The apparatus of claim 1 wherein the first die-ring has a carrier for positioning the nail blanks in the grooves of the first die-ring.

6. The apparatus of claim 1 wherein the first die-ring and the second die-ring are positioned at an angle to each other.

7. The apparatus of claim 1 further comprising a positioning roller for positioning the nail blanks in the grooves in the first and second die-rings at the proper location for the pre-bender.

8. A method for forming a circular offset head for a nail blank comprising the steps of:
   positioning the nail blank to expose an end of the nail blank;
   bending the exposed end of the nail blank by a pre-bender; and
   rolling the exposed end of the nail blank into an offset circular head by a head forming roller in a free-flow form.
9. The method of claim 8 further comprising:
   gripping the nail blank between two rotating die-rings;
   and
   rotating the die-rings from the pre-bender to the head
   forming roller.
10. The method of claim 8 wherein the step of bending the
    exposed end of the nail blank includes moving the nail blank
    across an angled surface of the pre-bender.
11. The method of claim 8 wherein the step of rolling the
    exposed end of the nail blank wire includes moving the end
    across an angled surface to a flat surface of the head forming
    roller.
12. A method of manufacturing a circular offset head nail
    comprising the steps of:
    feeding nail wire into a nail making apparatus;
    cutting the nail wire into nail blanks;
    feeding the nail blanks into grooves in a first die-ring and
    a second die-ring;
    positioning the nail blanks in the first and second die-rings
    to expose an end of the nail blanks;
    bending the end of the nail blanks by rotating the die-rings
    past a pre-bender; and
    forming the head in the bent end of the nail blank by
    rotating the nail blanks past a head forming roller to
    form the head in a free-flow form.
13. The method of claim 12 wherein bending the end of
    the nail blank includes moving the nail blank across an
    angled surface of the pre-bender.
14. The method of claim 12 wherein forming the head
    includes moving the bent end of the nail blank across an
    angled surface and a flat surface of the head forming roller.