Dec. 27, 1966 E. P. ANSTETT 3,294,303

NAILING STRIP AND NAILING MACHINE THEREFOR

Filed Oct. 30, 1964 4 Sheets-Sheet 1

Fig. 1.

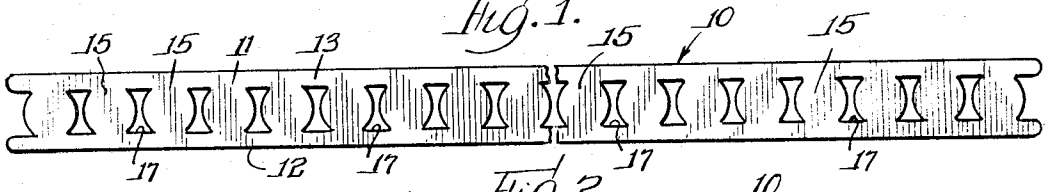


Fig. 2.

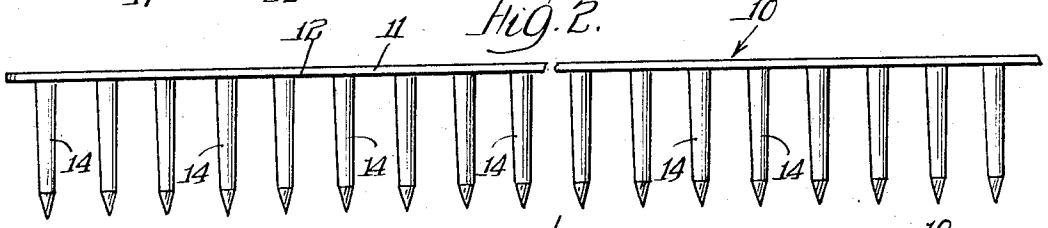


Fig. 3.

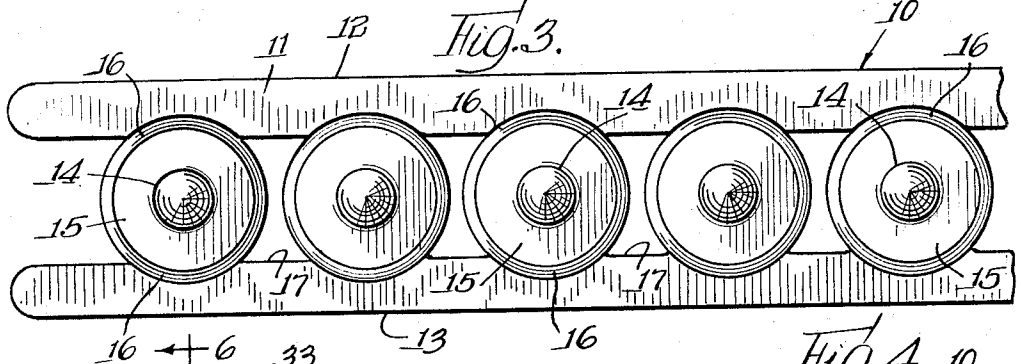


Fig. 4.

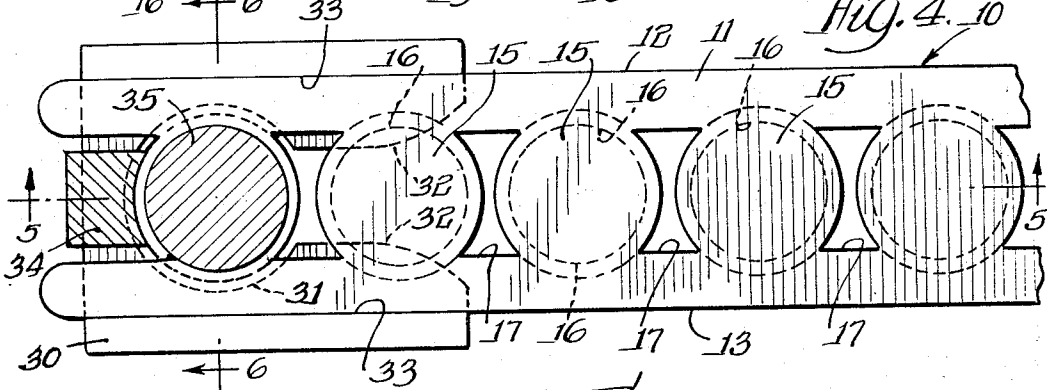
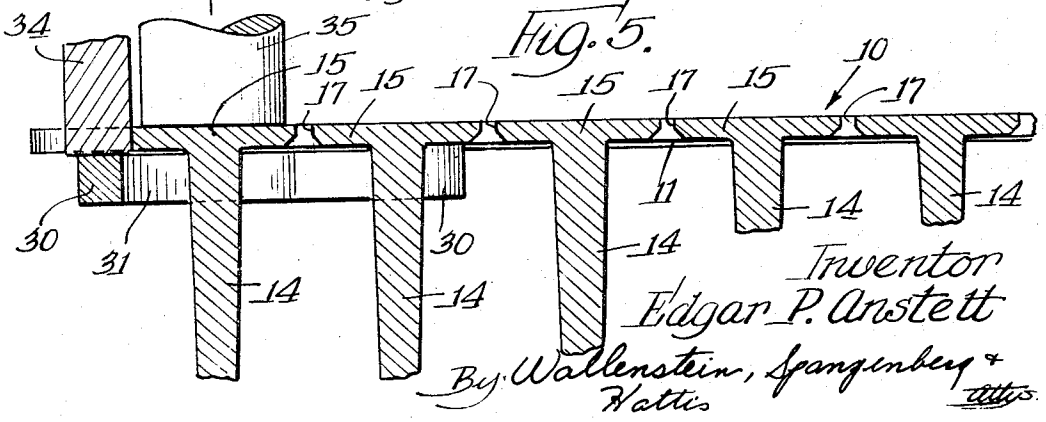


Fig. 5.



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NAILING STRIP AND NAILING MACHINE THEREFOR

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Fig. 6.

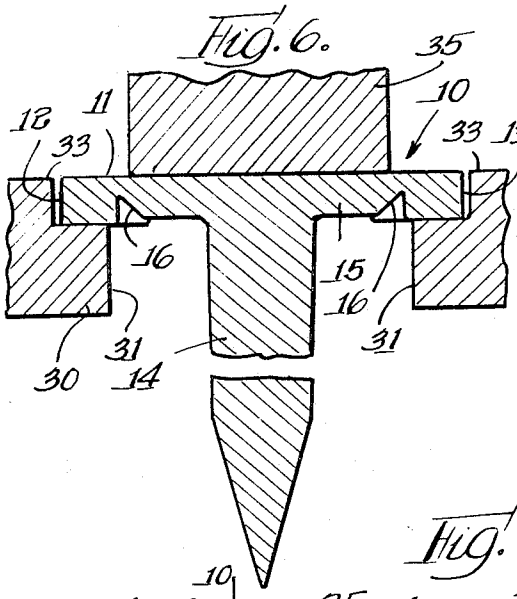

Fig. 7.

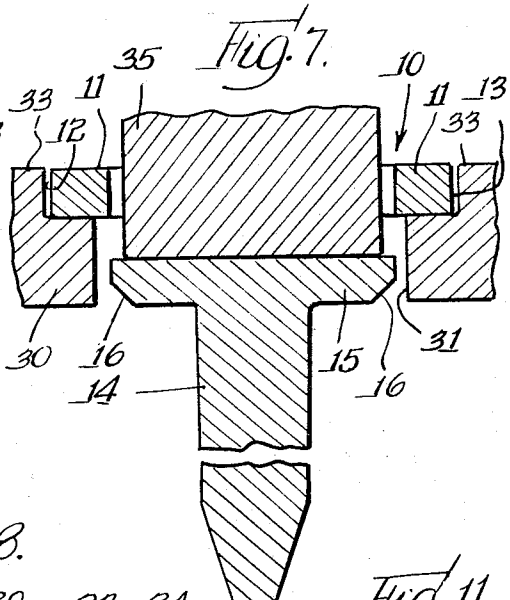

Fig. 8.

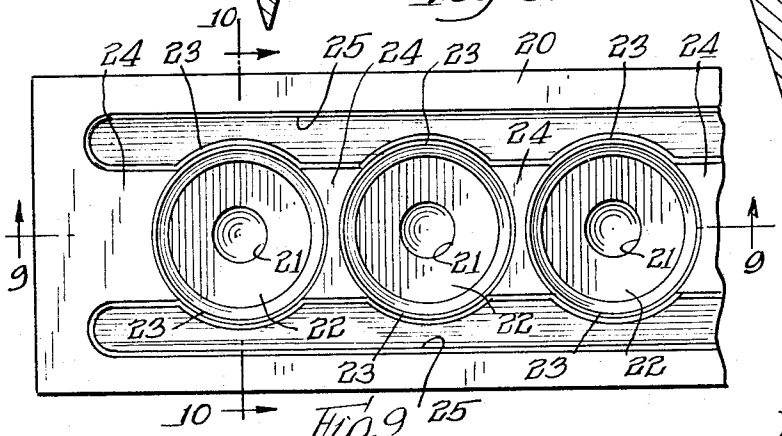

Fig. 9.

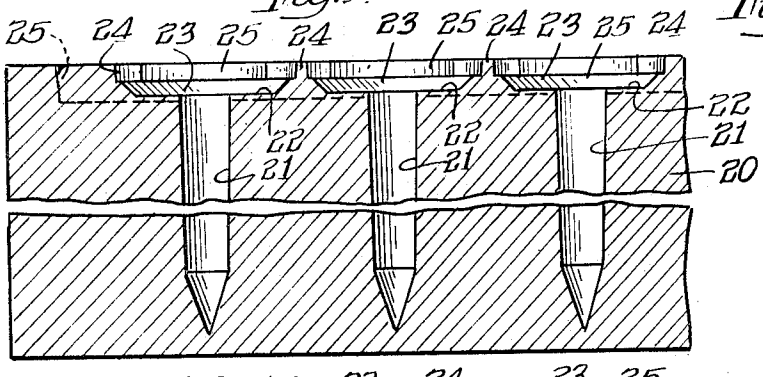

Fig. 10.

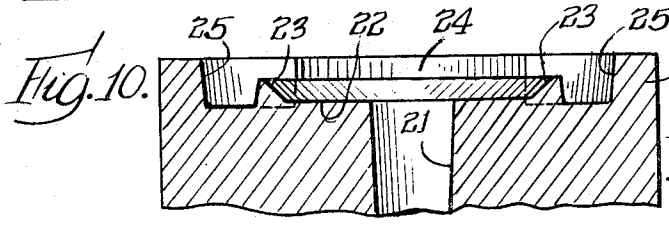

Fig. 11.

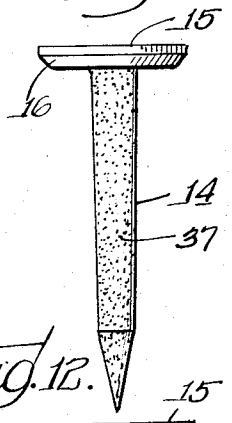

Fig. 12.

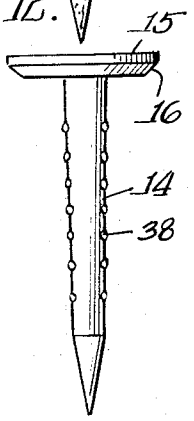

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Fig. 13.

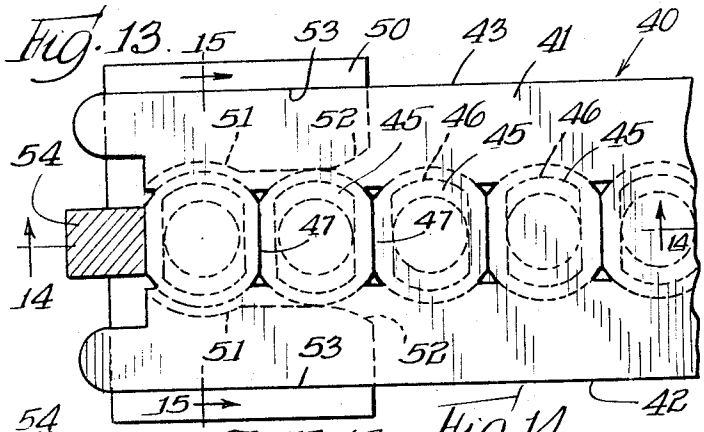

Fig. 15.

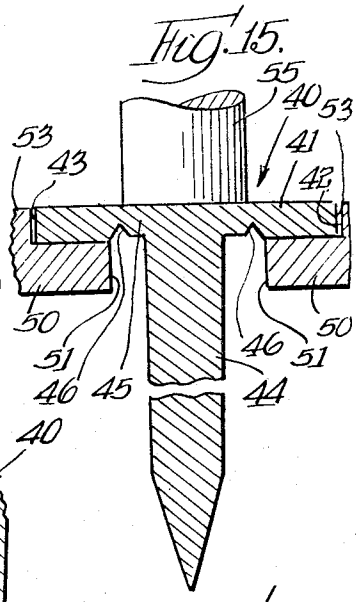

Fig. 14.

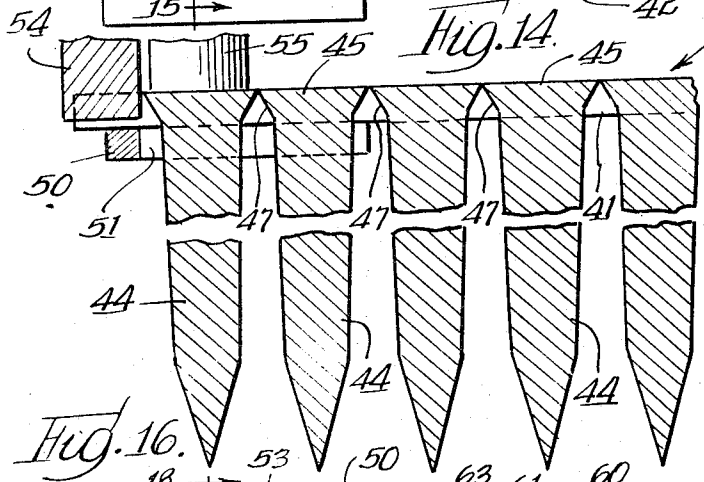

Fig. 18.

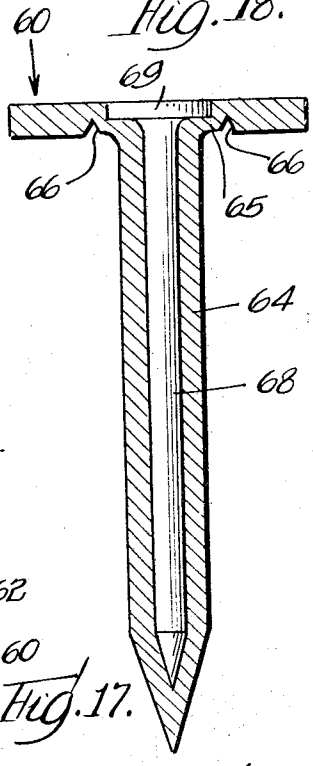

Fig. 16.

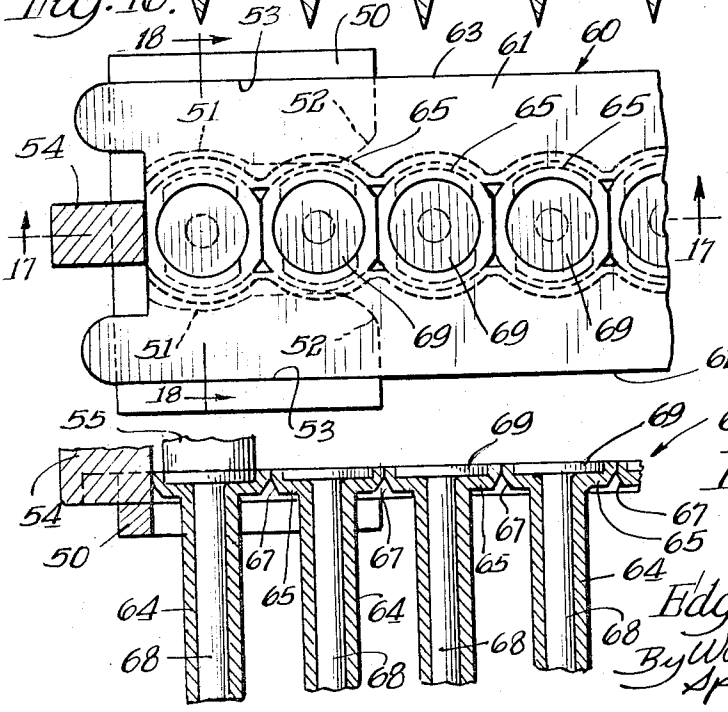

Fig. 17.

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Fig. 19.

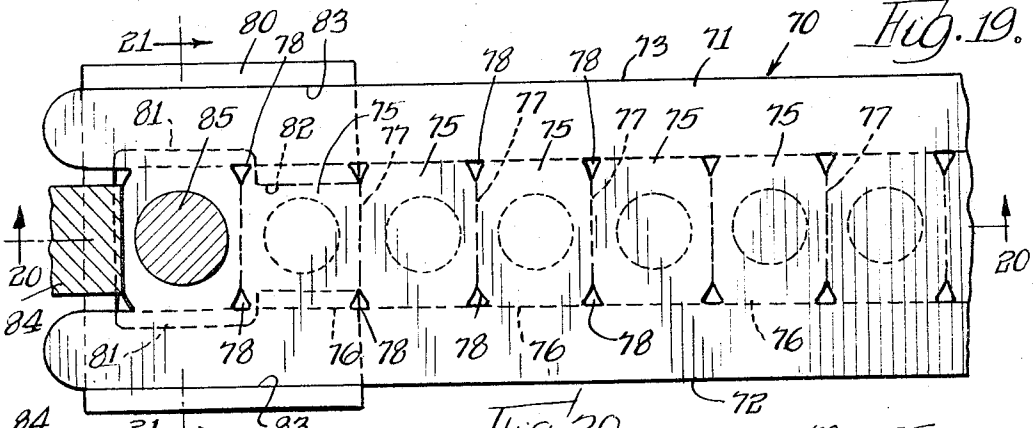
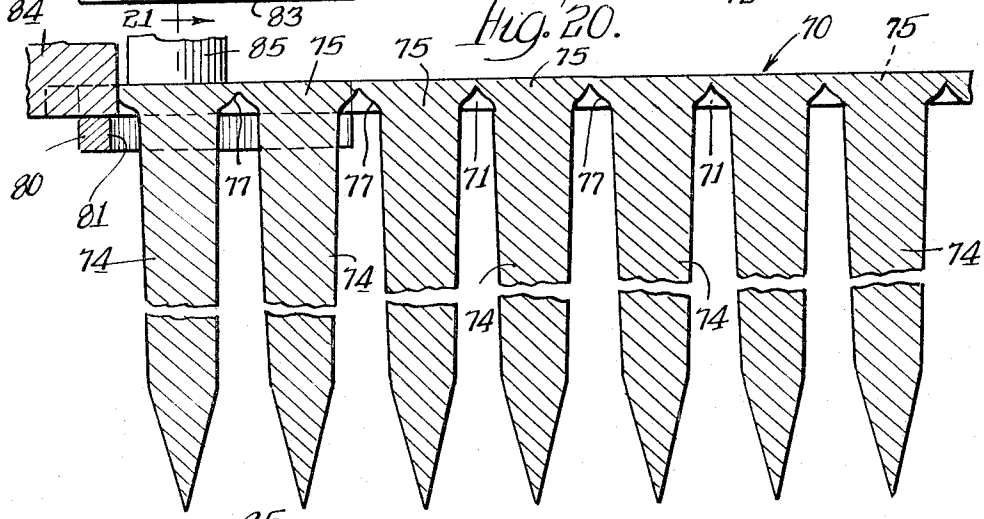


Fig. 20.



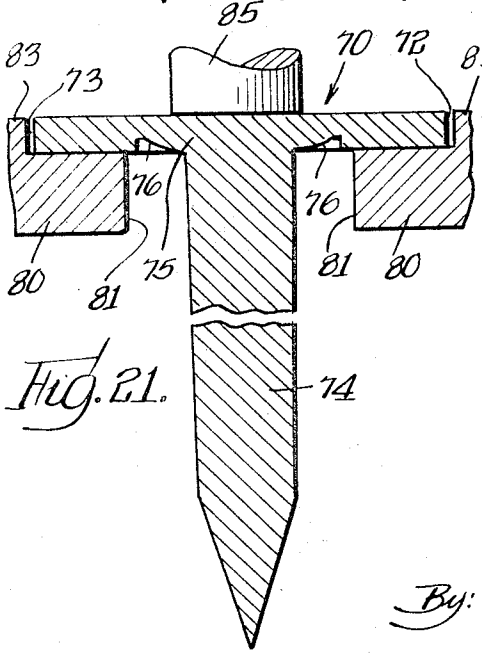


Fig. 21.

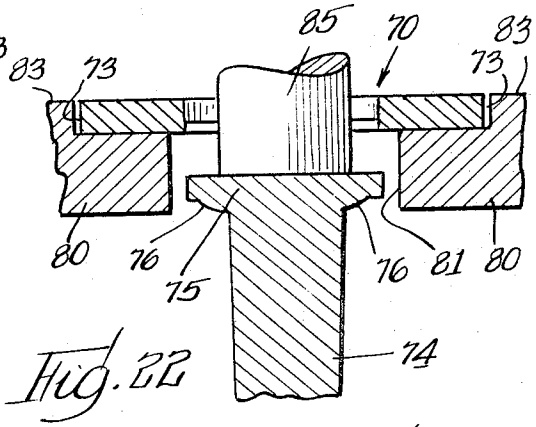


Fig. 22

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United States Patent Office 3,294,303 Patented Dec. 27, 1966

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NAILING STRIP AND NAILING MACHINE THEREFOR

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Filed Oct. 30, 1964, Ser. No. 407,630
5 Claims. (Cl. 227—95)

The principal object of this invention is to provide an improved nailing strip wherein headed nails may be progressively severed and driven therefrom by a nailing machine, such as the pneumatically power operated nailing machine disclosed in my copending application Serial No. 211,551, filed July 23, 1962, issued as Patent No. 3,211,352 on October 12, 1965, but wherein the die and plunger construction of the nailing machine has been modified to cooperate with the nailing strip of this invention. A further object of this invention resides in the cooperative relationship between the nailing strip of this invention and the modified nailing machine which has been modified in accordance with this invention.

In accordance with this invention, headed nails are not sheared or punched from the nailing strip nor are the heads thereof formed as they are sequentially driven from the nailing strip by the nailing machine, but, instead, the headed nails are predefined in the nailing strip and are broken therefrom by the nailing machine. As a result, uniformly dimensioned headed nails are formed, accurate feeding of the nailing strip in the nailing machine is facilitated, and the need for close tolerances in the die and plunger construction of the nailing machine is eliminated. By reason of this invention, therefore, nailing strips may be more accurately and inexpensively formed, predefined headed nails may be more accurately and readily severed and driven from a nailing machine, and the life of the nailing machine may be greatly extended.

Briefly, the nailing machine of this invention, may be of the type disclosed in my aforementioned copending application or of similar types, includes a backing die provided with an opening and a reciprocatable plunger in alignment with the die opening and having transverse dimensions which are substantially less than the die opening dimensions. Such a die and plunger construction differs from those of the aforementioned types of nailing machines wherein the headed nails are sheared or punched from the nailing strip and wherein the dimensions of the die opening and the plunger must necessarily be substantially the same within close tolerances.

The nailing strip of this invention for use in the nailing machine of this invention includes an elongated molded strip having substantially parallel side edges, and a plurality of pointed nail shanks extend from one face of the strip intermediate the side edges thereof and in spaced apart relation along the strip. Recesses are molded in at least one face of the strip about each nail shank to weaken the strip thereat and define the outline of a nailhead for each nail shank. The dimensions of the defined nailheads are less than the dimension of the backing die opening and greater than the dimension of the plunger.

When the nailing strip is fed into the nailing machine, the strip is backed by the backing die outwardly from the recesses since the backing die opening is of greater dimension than that of the predefined nailheads in the strip, and the plunger engages the strip within the recesses since the plunger dimension is less than the dimension of the predefined nailheads. As a result, the strip is sequentially fractured at the strip weakening and head defining recesses molded in the strip for sequentially severing and driving predefined headed nails from the strip as the strip is sequentially advanced between the backing die and the plunger. The nailing machine is provided with an indexing stop for controlling the intermittent or sequential advance of the nailing strip.

Since the headed nails are predefined by the molded recesses, since the dimension of the backing die opening is substantially greater than the transverse dimension of the plunger, and since the dimension of the predefined nailheads is intermediate the substantially different dimensions of the backing die opening and the plunger, fracturing of the strip at the weakening and head defining recesses therein is assured to provide for the accurate severence of uniform predefined headed nails from the strip, and this is so even though there might be some inaccuracies in the indexing of the strip as it is advanced in the nailing machine. Since there is no shearing or punching by the backing die and plunger, they will have substantially no wear and have substantially infinite life which is not the case where shearing or punching is involved.

The nail shanks are preferably integrally molded with the strip and its weakening and nailhead defining recesses in a single operation, and while various molding methods may be utilized, particularly good results have been obtained by die casting the nailing strip in die casting molds and utilizing zinc or the like as the cast material which readily fractures at the weakened and head defining recesses in the strip. If desired, the molded headed nails may be reinforced with headed reinforcing nails which are embedded in the nailing strip during the molding operation. The molded weakening and head defining recesses need only extend partially through the molded strip, but it has been found advantageous to have portions of the recesses extending completely through the strip, particularly those portions of the recesses which are arranged between the nail shanks and which cooperate with the indexing stop of the machine for indexing the advance of the nailing strip in the machine. Preferably, the nail shanks extending from the nailing strip are roughened to increase their holding power when driven into an object, particularly good results being obtained when the roughening is accomplished by sandblasting or mechanical scoring.

Further objects of this invention reside in the construction of the nailing strip, the construction of the backing die and plunger arrangement of the nailing machine and in the cooperative relationships between the same.

Other objects and advantages of this invention will become apparent to those skilled in the art upon reference to the accompanying specification, claims and drawings in which:

FIG. 1 is a top plan view of one form of the nailing strip of this invention.

FIG. 2 is a side elevational view of the nailing strip illustrated in FIG. 1.

FIG. 3 is a bottom view, on an enlarged scale, of the nailing strip illustrated in FIG. 1.

FIG. 4 is a top plan view of a portion of the nailing strip illustrated in FIGS. 1 to 3 being fed to the backing die and plunger arrangement of a nailing machine with portions of the backing die and plunger shown in section.

FIG. 5 is a vertical sectional view taken substantially along the line **5—5** of FIG. 4.

FIG. 6 is a vertical sectional view taken substantially along the line **6—6** of FIG. 4 and showing the headed nail before severance.

FIG. 7 is a vertical sectional view like that of FIG. 6 but showing the headed nail being severed.

FIG. 8 is a top plan view of a portion of the die for molding or casting the nailing strip of FIGS. 1 to 3.

FIG. 9 is a vertical sectional view through the die taken substantially along the line **9—9** of FIG. 8.

FIG. 10 is a vertical sectional view through the die taken substantially along the line **10—10** of FIG. 8.

FIG. 11 is a side elevational view of a severed headed nail and showing the shank thereof to be roughened by sandblasting.

FIG. 12 is a view similar to FIG. 11 but showing the shank thereof roughened by mechanical scoring.

FIG. 13 is a top plan view of another form of the nailing strip of this invention shown in conjunction with the backing die and plunger arrangement.

FIG. 14 is a sectional view taken substantially along the line **14**—**14** of FIG. 13.

FIG. 15 is a sectional view taken substantially along the line **15**—**15** of FIG. 13.

FIG. 16 is a top plan view of still another form of the nailing strip of this invention wherein the headed nails are reinforced and also showing the nailing strip in association with the backing die and plunger arrangement.

FIG. 17 is a vertical sectional view taken substantially along the line **17**—**17** of FIG. 16.

FIG. 18 is a vertical sectional view taken substantially along the line **18**—**18** of FIG. 16.

FIG. 19 is a top plan view of a further form of the nailing strip of this invention and shown in association with the backing die and plunger assembly.

FIG. 20 is a vertical sectional view taken substantially along the line **20**—**20** of FIG. 19.

FIG. 21 is a vertical sectional view taken substantially along the line **21**—**21** of FIG. 19 and showing the headed nail before severence.

FIG. 22 is a vertical sectional view similar to FIG. 21 but showing the headed nail being severed from the nailing strip.

Referring first to FIGS. 1 to 7 of the drawings, one form of the nailing strip of this invention is generally designated at **10**. It includes an elongated molded or die cast strip **11** having substantially parallel side edges **12** and **13**. A plurality of pointed nail shanks **14** extend from one face of the strip **11** intermediate the side edges **12** and **13** and in spaced apart relation along the strip. These pointed nail shanks **14** are preferably molded or die cast integrally with the strip **11** in a single molding or die casting operation. Recesses **16** and **17** are molded in the strip **11** about each nail shank **14** to weaken the strip **11** thereat. It is here noted that the arcuate recesses **16** which are between the nail shanks **14** and the side edges **12** and **13** of the strip **11** extend only partially through the strip **11**, while the double arcuate recesses **17** between the nail shanks **14** extend completely through the strip **11**. The recesses **16** and **17** define the outline of a nailhead **15** for each nail shank **14**.

Referring now to FIGS. 8 to 10, a mold for molding or die casting the nailing strip is shown at **20**. It includes a plurality of holes **21** which operate to form the nail shanks **14**. Arranged around each hole **21** is an annular recess **22** which forms the bottom surface of each nailhead **15**. Around each recess **22** laterally of the hole **21** is a pair of arcuate bosses **23** which operate to form the recesses **16** in the nailing strip. It is noted that these bosses **23** extend only part way up to the top surface of the die **20** so that the recesses **16** in the nailing strip **11** formed thereby extend only partially through the nailing strip. The annular recesses **22** are also provided with arcuate bosses **24** between the holes **21**, which bosses extend up to the top surface of the mold **20**. These bosses **24** form the recesses **17** in the nailing strip **11** and since the bosses **24** extend to the top surface of the mold **20** the recesses **17** in the strip **11** extend completely through the strip **11**. The mold **20** also is provided with a pair of elongated recesses **25** laterally from the bosses **23** and **24**, these elongated recesses **25** forming the sides of the nailing strip **11** with the side edges **12** and **13**. Molten material, such as a zinc alloy or the like, is poured into the mold **20** to the top surface thereof and is allowed to cool and solidify therein, and when the solidified material is removed from the mold **20**, it forms the nailing strip generally designated at **10** in FIGS. 1 to 7. It is here noted that the holes and recesses in the mold **20** have a taper so as to permit ready removal of the molded or die cast nailing strip **11** therefrom.

The manner in which the nailing strip cooperates with the backing die and the plunger of a nailing machine for severing and driving headed nails from the nailing strip is illustrated in FIGS. 4 to 7. Here the nailing machine, which may be of the type disclosed in my copending application, S.N. 211,551, filed July 23, 1962, issued as Patent No. 3,211,352 on Oct. 12, 1965, includes a backing die **30** provided with a relatively large opening **31** extending therethrough. The backing die **30** is also provided with a feed slot **32** so as to allow the nail shanks **14** of the nailing strip to enter the die opening **31**. The backing die **30** also includes guide portions **33** for engaging the side edges **12** and **13** of the nailing strip for guiding the same through the backing die **30**. The nailing machine also includes an indexing stop **34** for successively engaging the predefined nailhead portions **15** of the strip **11** to index the nailing strip **10** through the nailing machine. Means such as disclosed in said Patent No. 3,211,352 are provided for advancing the nailing strip **10** through the nailing machine. The nailing machine also includes a plunger **35** concentrically arranged with the backing die opening **31**, the plunger **35** being reciprocated up and down.

It is here noted that the opening **31** in the backing die **30** is substantially larger than the dimension of the nailhead **15** defined by the recesses **16** and **17** in the nailing strip and that the plunger **35** has a transverse dimension which is substantially less than the dimensions of the predefined nailhead **15**. As a nailing strip **11** is fed between the backing die **30** and the plunger **35**, as illustrated in FIGS. 4 and 5, the first predefined nailhead **15** in the strip engages the indexing stop **34** so as to centrally locate the same with respect to the die opening **31** and the plunger **35**. As shown more clearly in FIGS. 6 and 7, the plunger **35** engages the predefined nailhead **15** and forces the same downwardly whereupon the nailing strip is fractured at the recesses **16** so as to sever and drive predefined headed nails from the nailing strip. Because of the relative dimensions of the backing die opening **31**, the predefined nailhead **15** of the headed nail and the plunger **35**, the severance of the headed nail from the nailing strip is not brought about by shearing or punching but, is brought about by fracturing the nailing strip at the weakening and nailhead defining recesses **16**. After the first headed nail is driven from the strip **11** and the plunger **35** retracted, the strip advances to a position where the next predefined headed nail engages the indexing stop **34** so as to be concentrically arranged with respect to the backing die opening **31** and the plunger **35**, ready for being severed and driven by the plunger **35** in the manner described above.

FIGS. 11 and 12 illustrates the headed nails after they have been severed and driven from the nailing strip. They also show the roughening of the nail shanks **14** which operates to increase the holding power of the nails. In FIG. 11 the roughening of the nail shanks has been accomplished by sandblasting as illustrated at **37**, and in FIG. 12 the roughening has been accomplished by mechanical scoring of the nail shanks as indicated at **38**. Of course, the roughening of the nail shank **14**, either by sandblasting or by mechanical scoring, is done following the molding or die casting of the nailing strip and prior to use of the nailing strip in the nailing machine.

Another form of the nailing strip of this invention is generally designated at **40** in FIGS. 13 to 15. Here, the molding strip **40** includes a molded or die cast strip **41** having side edges **42** and **43**, and a plurality of pointed nail shanks **44** extend from one face of the strip **41** intermediate the side edges thereof and in spaced apart relation along the strip. The nail shanks **44** are provided with predefined nailheads **45**, which are predefined by

recesses 46 laterally of the nail shanks and recesses 47 between the nail shanks. The recesses 46 extend only partially through the strip 41 while the recesses 47 extend completely therethrough.

The nailing strip 40 is fed into a nailing machine having a backing die 50 provided with an opening 51 and a slot 52 to allow feeding of the nailing strip thereto. The backing die 50 is also provided with guide surfaces 53 to be engaged by the side edges 42 and 43 of the nailing strip for guiding the nailing strip. The nailing machine also includes an indexing stop 54 and a reciprocatable plunger 55. Here again, the dimensions of the backing die opening 51 are substantially greater than the dimensions of the nailhead 45 predefined by the recesses 46 and 47, and the dimensions of the plunger 55 are substantially less than the dimensions of the predefined nailhead. The manner in which the predefined headed nails of the nailing strip 40 are fractured at the recesses 46 and severed and driven from the nailing strip is indicated in FIG. 15 and it is substantially the same as that described above in connection with FIGS. 1 to 7, and accordingly, a further description is not considered necessary. The nailing strip 40 is molded or die cast in a suitable mold in substantially the same manner as described above in connection with FIGS. 8 to 10. Of course, the mold cavities are somewhat different so as to provide the shape of the predefined headed nails as illustrated in FIGS. 13 to 15. The shapes of the predefined nailheads of the nailing strip 40 are somewhat different than those of the nailing strip 10, and by reason of the arrangement of the nailing strip 40 it can contain more nails in a given length than in the nailing strip 10.

Another form of nailing strip is generally designated at 60 in FIGS. 16 to 18. Here the nailing strip includes a molded or die cast elongated strip 61 having substantially parallel side edges 62 and 63 and a plurality of pointed nail shanks 64 extending from one face of the strip intermediate the sides edges and in spaced apart relation along the strip. The nailing strip is provided with recesses 65 laterally of the nail shanks 64 and recesses 67 between the nail shanks 64 for weakening the nailing strip and predefining nailheads 65 for the nail shanks 64. Here the predefined headed nails are reinforced with reinforcing nails having shanks 68 and heads 69, the reinforcing nails being formed of steel or the like. The reinforcing nails are embedded in the nailing strip during the molding or die casting thereof, they being suitably suspended in the recesses and holes in the mold during the molding or die casting. Here, as in the previous forms of the invention, the recesses 67 between the predefined nailheads 65 may extend completely through the strip 61. The nailing strip is fed into a nailing machine which may be like that described above in connection with FIGS. 13 to 15 and, accordingly, like reference characters for like parts have been utilized. The manner in which the predefined nailheads 65 are fractured at the recesses 66 and in which the reinforced and predefined headed nails are severed and driven from the nailing strip are substantially the same as described above and, accordingly, a further description is not here considered necessary.

Still another form of nailing strip of this invention is designated at 70 in FIGS. 19 to 22. Here, the nailing strip 70 includes an elongated molded or die cast strip 71 having substantially parallel side edges 72 and 73 and a plurality of pointed nail shanks 74 extending from one face of the strip intermediate the side edges thereof and in spaced apart relation along the strip. Recesses 76 are molded in the strip laterally of the nail shanks 74, recesses 77 are molded in the strip intermediate the nail shanks 74 and recesses 78 are molded in the nailing strip between the recesses 76 and 77, all of said recesses 76, 77 and 78 operating to weaken the nailing strip thereat and to predefine integral nailheads 75 for the nail shanks 74. The recesses 76 and 77 extend only part way through the strip 71 while the recesses 78 extend completely therethrough.

The nailing strip 70 is fed into a nailing machine having a backing die 80 provided with a relatively large opening 81 and with a slot 82 for accommodating the nail shanks 74 as the nailing strip is advanced. The backing die 80 is also provided with guide surfaces 83 which are engaged by the side edges 72 and 73 of the nailing strip for guiding the nailing strip as it is advanced. The nailing machine also includes an indexing stop 84 which engages the predefined heads 75 of the nailing strip. Here also, the dimensions of the die opening 81 are substantially greater than the dimensions of the predefined nailheads 75 and the dimensions of the plunger 85 are substantially less than the dimensions of the predefined nailheads 75. When the plunger 85 is advanced, as illustrated in FIGS. 21 and 22, the nailing strip is fractured at the recesses 76 and 77 so as to sever and drive predefined headed nails from the nailing strip substantially as described above in connection with the other forms of this invention. Since both the recesses 76 and 77 extend only part way through the strip 71, it is preferable to utilize the recesses 78 which extend completely through the strip 71 so that there is a clean fracture of the nailing strip at the corners of the predefined heads 75 of the nails.

While for purposes of illustration several forms of this invention have been disclosed, other forms thereof may become apparent to those skilled in the art upon reference to this disclosure and, therefore, this invention is to be limited only by the scope of the appended claims.

I claim as my invention:

1. A nailing strip for use in a nailing machine including a backing die provided with an opening and a reciprocatable plunger in alignment with the die opening, wherein said nailing strip comprises an elongated molded fracturable strip having substantially parallel side edges and a width so that the lateral side portions thereof overlie the backing die, a row of a plurality of pointed nail shanks extending from one face of the strip intermediate the side edges thereof in spaced apart relation along the strip, and recesses molded in at least one face of the strip about each nail shank between the nail shanks and between the nail shanks and the lateral side portions of the strip to weaken the strip thereat for facilitating fracture thereat and to define the outline of a nailhead for each nail shank, whereby when said lateral side portions of the strip overlie the backing die and the strip is subsequentially engaged by the plunger within said recesses, the strip is sequentially fractured at said recesses for sequentially severing and driving predefined headed nails therefrom.

2. A nailing strip for use in a nailing machine including a backing die provided with an opening and a reciprocatable plunger in alignment with the die opening, wherein said nailing strip comprises an elongated molded fracturable strip having substantially parallel side edges and a width so that the lateral side portions thereof overlie the backing die, a row of a plurality of pointed nail shanks extending from one face of the strip intermediate the side edges thereof in spaced apart relation along the strip, and recesses molded in at least one face of the strip about each nail shank between the nail shanks and between the nail shanks and the lateral side portions of the strip to weaken the strip thereat to facilitate fracture thereat and to define the outline of a nailhead for each nail shank, the molded recesses laterally from the nail shanks extending only partially through the molded strip and the molded recesses between the nail shanks extending completely through the molded strip and forming indexing slots for the nailing strip, whereby when said lateral side portions of the strip overlie the backing die and the strip is sequentially engaged by the plunger within said recesses, the strip is sequentially fractured at said recesses for sequentially severing and driving predefined headed nails therefrom.

3. A molded nailing strip for use in a nailing machine including a backing die provided with an opening and a reciprocatable plunger in alignment with the die opening and having transverse dimensions substantially less than

the die opening dimensions, wherein said molded nailing strip comprises an elongated molded strip having substantially parallel side edges and a width so that the lateral side portions thereof underlie the backing die, a row of a plurality of pointed nail shanks integrally molded with the strip and extending from one face of the strip intermediate the side edges thereof in spaced apart relation along the strip, headed reinforcing nails molded in the nailing strip with the heads thereof molded in the molded strip and the shanks thereof molded in the molded shanks, and recesses molded in at least one face of the molded strip about each molded nail shank between the nail shanks and between the nail shanks and the lateral side portions of the strip to weaken the strip thereat and define the outline of an integral reinforced nailhead for each reinforced nail shank, the dimensions of the defined nailheads being less than the dimension of the opening of the backing die and greater than the dimension of the plunger so that, when the strip is backed by the backing die outwardly from the strip weakening and head defining recesses and is sequentially engaged by the plunger within said recesses, the strip is sequentially fractured at said recesses for sequentially severing and driving predefined reinforced headed nails therefrom.

4. A die cast nailing strip for use in a nailing machine including a backing die provided with an opening and a reciprocatable plunger in alignment with the die opening and having transverse dimensions substantially less than the die opening dimensions, wherein said die cast nailing strip comprises an elongated die cast strip having substantially parallel side edges and a width so that the lateral side portions thereof underlie the backing die, a row of a plurality of pointed nail shanks integrally cast with the strip and extending from one face of the strip intermediate the side edges thereof in spaced apart relation along the strip, headed reinforcing nails embedded in the nailing strip with the heads thereof cast in the cast strip and the shanks thereof cast in the cast shanks, and recesses cast in at least one face of the cast strip about each cast nail shank between the nail shanks and between the nail shanks and the lateral side portions of the strip to weaken the strip thereat and define the outline of an integral reinforced nailhead for each reinforced nail shank, the dimensions of the defined nailheads being less than the dimension of the opening of the backing die and greater than the dimension of the plunger so that, when the strip is backed by the backing die outwardly from the strip weakening and head defining recesses and is sequentially engaged by the plunger within said recesses, the strip is sequentially fractured at said recesses for sequentially severing and driving predefined reinforced headed nails therefrom.

5. A nailing machine for sequentially severing and driving predefined headed nails from a nailing strip comprising a molded fracturable strip having lateral side portions and a row of spaced nail shanks extending from one side thereof and head defining recesses in one face of the strip about each nail shank, said nailing machine including a backing die provided with an opening and a reciprocatable plunger in alignment with the opening in the die and having transverse dimensions substantially less than the dimensions of the opening in the die, the transverse dimensions of the opening in the backing die being greater than the dimensions of the defined nail heads in the nailing strip and the transverse dimensions of the plunger being less than the dimensions of the defined nail heads in the nailing strip, and means in the nailing machine for guiding and intermittently advancing the nailing strip between the backing die and the plunger with the backing die underlying the lateral side portions of the nailing strip to sequentially position the defined nail heads in the strip in alignment with the opening in the backing die so that the plunger sequentially fractures the nailing strip at the head defining recesses therein and drives predefined headed nails from the strip.

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