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[54] **METHOD AND APPARATUS FOR ASSEMBLING STRIPS OF FASTENERS**

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[73] Assignee: **Signode Corporation,** Glenview, Ill.

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[52] **U.S. Cl.** **53/3;** 53/148; 156/285; 156/499

[51] **Int. Cl.** **B65b 19/34**

[58] **Field of Search** 53/3, 25, 33, 48, 148, 53/184, 196, 198, 200, 236; 156/285, 301, 312, 444, 497, 499, 552

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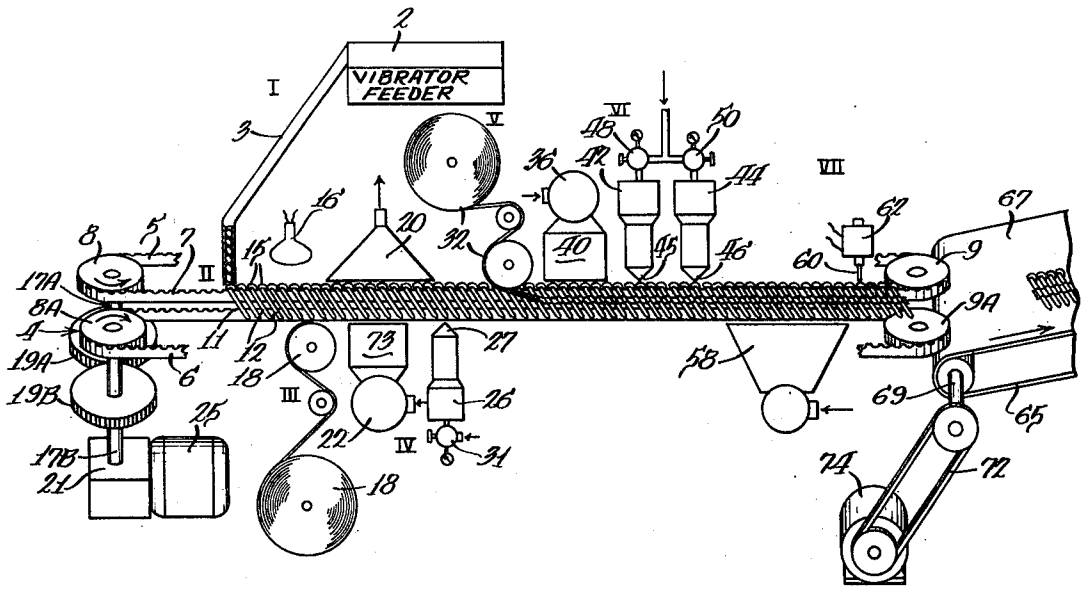
[57] **ABSTRACT**

A method and apparatus for forming a strip of nails. A plurality of heated nails is conveyed with shanks positioned in a side-by-side closely-spaced array past tape feeders which direct respective strips of thermoplastic tape transversely and tangentially over the upper and lower sides of the array. Successive low pressure and high pressure heated air currents are directed against both upper and lower tapes to envelop each shank positively with a uniform thickness of plastic and form a unitary strip of nails.

18 Claims, 3 Drawing Figures



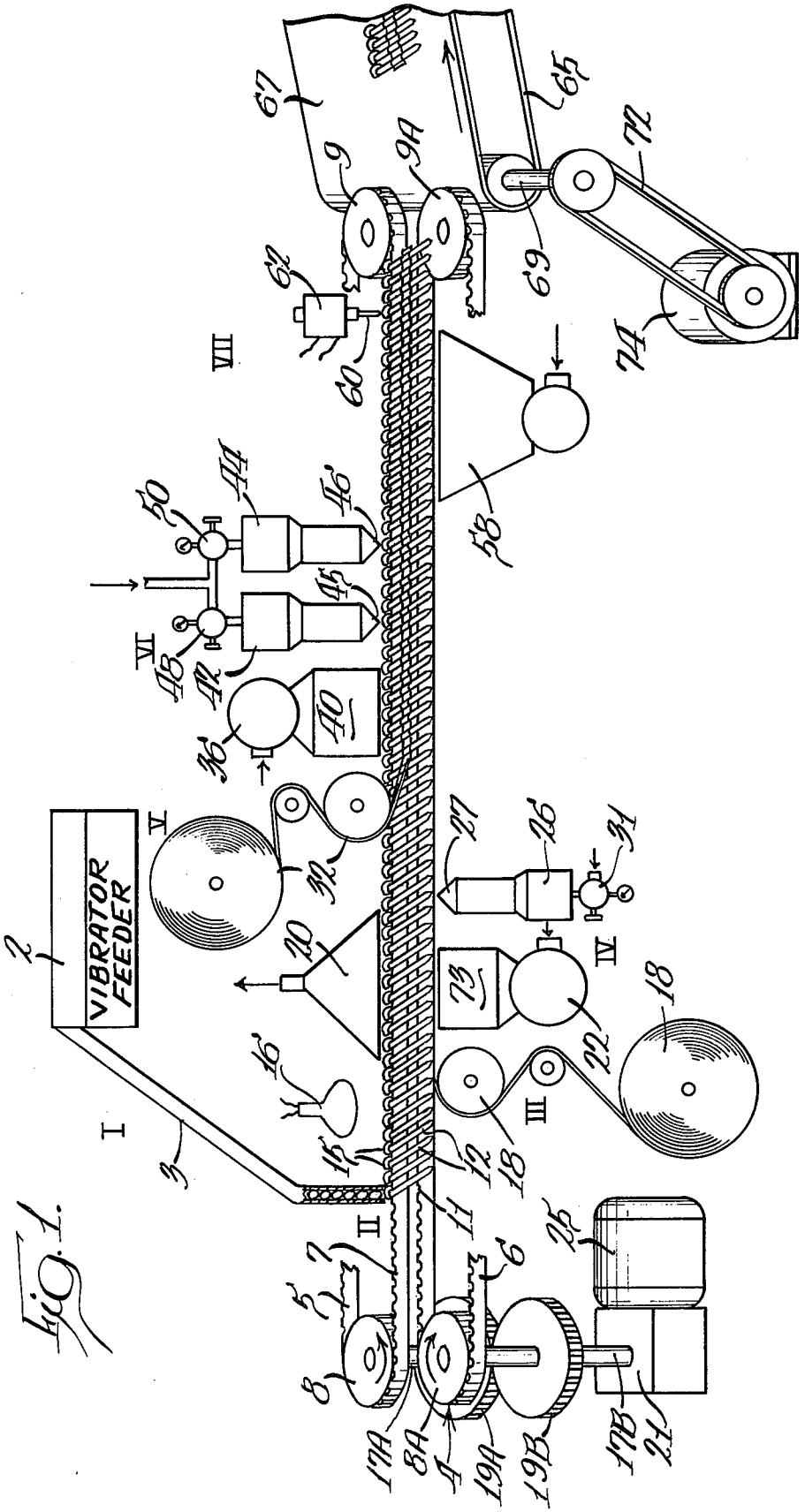

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Fig. 1.

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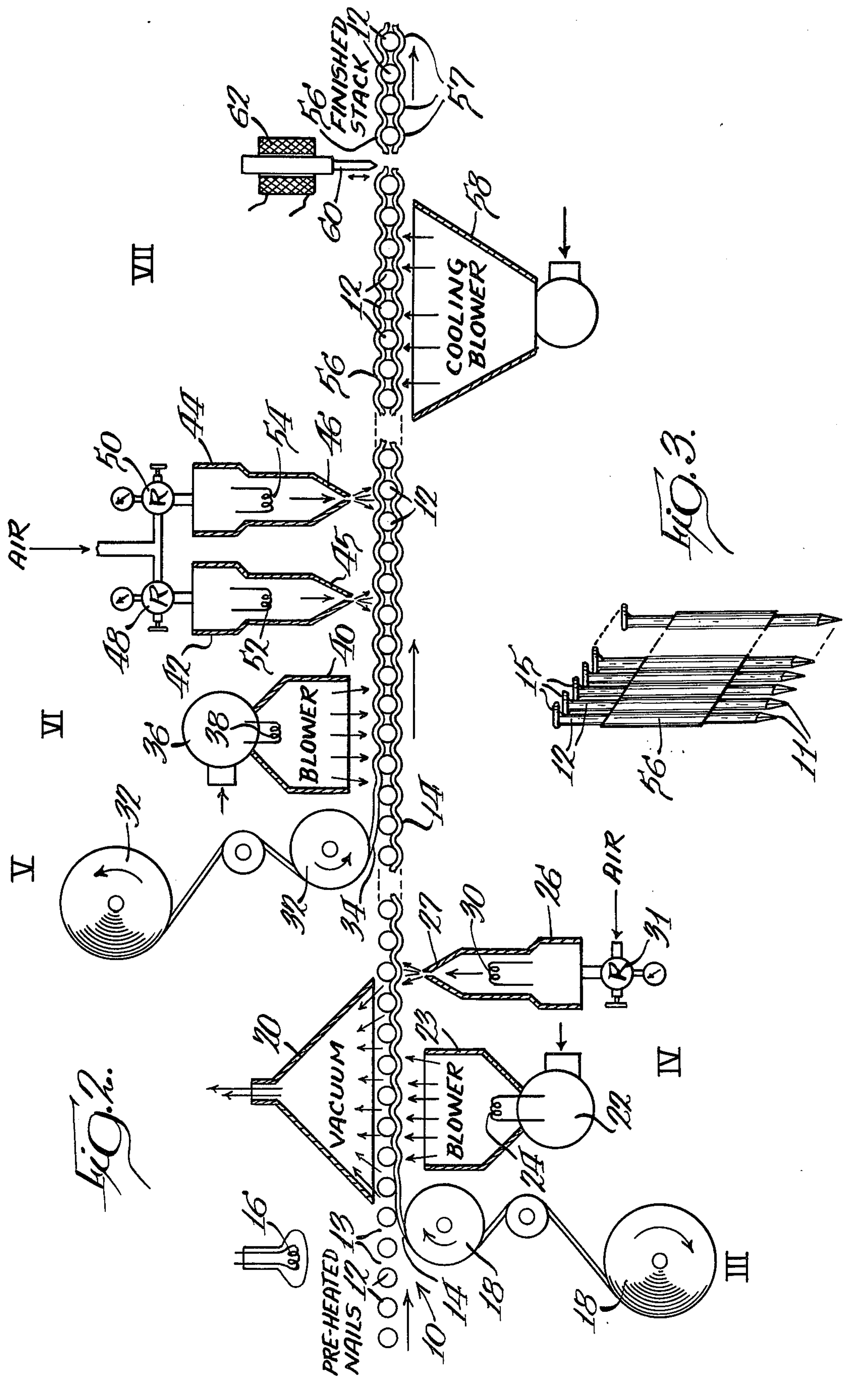
SHEET 2 OF 2



METHOD AND APPARATUS FOR ASSEMBLING STRIPS OF FASTENERS

BACKGROUND OF THE INVENTION

This invention relates to a method of producing strips of fasteners such as nails and the like and apparatus for assembling fastener strips useful in fastener driving tools. Strips of nails and fasteners of similar type, having their shanks joined by numerous different expedients, have been in growing demand from users of fastener driving tools. Along with the growth in usage has come a demand for improved types of fastener strips affording greater reliability, freedom from jamming, and improved holding power after having been driven into a workpiece. One such improved fastener strip is disclosed in the copending application of Lawrence S. Shelton for "Fastener Strip," Ser. No. 354,313, filed Apr. 25, 1973, assigned to the assignee of the present invention.

Along with the demand for such an improved fastener strip has come the need for a method as well as apparatus for producing the strip. Furthermore, because such fastener strips are currently being used in tools operating at a high rate of speed where a malfunction may be caused if the fastener strip is not of a uniformly high standard, a need has arisen in the art for a method and apparatus for producing a fastener strip which is highly accurate and yielding improved uniformity of result, while not sacrificing speed in the production of the strip.

Also, in the production of such strips, particularly those involving the use of a plastic or adhesive, it has been found that the tendency of the plastic or adhesive to adhere to various mechanical components with which the strip comes into contact during manufacture has caused interference with the smooth operation of the fastener producing apparatus, as well as adversely affected the quality of the product.

SUMMARY OF THE INVENTION

In accordance with the invention, fastener strip assembly apparatus is provided for use with thermoplastic tape and a flat parallel array of fasteners having elongated shanks disposed side-by-side and defining uniform gaps between said shanks. The apparatus includes tape dispensing means for directing first and second strips of thermoplastic tape transversely across the shanks of the array on opposite sides thereof.

The strips are then made to affix the fasteners permanently in their arrayed relationship by the provision of means for forcing heated air upon both strips so as to urge said strips inwardly within the gaps between the shanks into contact about said shanks, thereby enveloping at least a portion of each shank and joining the array of fasteners together to form a unitary fastener strip.

The apparatus thus obviates the need for any mechanical contact with the tape to effect its formation about the shanks, so that problems caused by the adhesion of heated tape to such mechanical components cannot arise, and the uniformity of the tape thickness about each shank is optimized.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a partially schematic view of the fastener strip assembly apparatus of the invention, showing the manner in which thermoplastic tape is applied to the shanks of an array of nails in plan view to produce a unitary strip;

FIG. 2 is a schematic enlarged view of a portion of the apparatus of FIG. 1 in more detail, showing the array of nails in cross-section; and

FIG. 3 is an elevation view of a finished strip of nails produced in accordance with the invention.

DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a preferred embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

Referring first to FIG. 1, there is shown an illustrative embodiment of the apparatus of the invention which accepts modified nails **11**, which are common nails having elongated shanks **12** that have had one side of their heads **15** removed along a chord thereof so that the chord sections preferably are slightly spaced from, or protrude slightly beyond, the periphery of the shank **12** on the modified side. When so formed, heads **15** thereafter resemble a "half-moon."

In general, the apparatus causes the nails to be moved through a series of stations, where: (I) the modified nails are received and collated; (II) the modified and collated nails are deposited on a conveyor which maintains them in an aligned side-by-side parallel spaced relationship to define nail array **10**; (III) a strip of tape **14** of thermoplastic material is applied to the lower shanks of the nails **10** transversely to the orientation of the shanks, as well as tangentially of the shanks, and in the direction of movement of the array; (IV) heated air under pressure is directed upwardly against the shanks to urge the tape into adhesion with the shanks; (V) a second strip of tape **34** is applied to the upper side of the arrayed nail shanks; (VI) heated air under pressure is directed downwardly to urge the tape into adhesion with the nail shanks; (VII) the completed nail strip is cooled and cut into sticks of convenient lengths; and (VIII) the finished nail sticks are conveyed to storage.

Initially at station (I), a collating apparatus which includes a vibratory feeder **2** is continuously supplied with modified nails **11** and positions the nails so that the heads thereof are adjacent one another and the shanks thereof are in side-by-side relationship. The feeder **2** directs the aligned nails **11** to a track assembly **3** which is downwardly inclined and which has narrow internal dimensions such that the nails descend in line side-by-side, and come together near the outlet of the track in a stepped configuration. That is, a portion of the top of each head underlies a portion of the lower surface of the adjacent nail head. The collating apparatus comprising feeder **2** and track assembly **3** is well known and may be any one of a number of those commercially available; consequently, further detailed description is not necessary.

Immediately beneath the outlet of track assembly **3** is conveyor assembly **4** continuously accepting nails therefrom. The nails are deposited from the track assembly upon conveyor assembly **4** in a side-by-side par-

allel relationship, and with heads **15** in stepped relationship to define the horizontal nail array **10.** Since the chord section of each head abuts the shank of the adjacent heads, gaps **13** between adjacent one of the shanks **12** of the array are defined, and match the spacing of the chord from its shank. Such gaps are thus uniform in width and preferably are a small fraction of the diameter of the shanks; the relative size of the gaps has been exaggerated in FIGS. **1** and **2** for clarity. The parallel side-by-side nail array relationship, together with the spacing of gaps **13,** is maintained as the array is moved along because of the construction of conveyor **4.**

More particularly, the nail shanks are supported on conveyor straps **5** and **6,** which are adjacent each other and parallel, with a spacing therebetween less than the length of the nail shanks, and are driven synchronously with each other. The straps **5** and **6** are provided with notches **7,** which are regularly spaced by an amount matching that of the gaps **13** and which are generally semicircular and of a diameter slightly larger than the shanks **12.** The conveyor straps **5** and **6** are relatively narrow and provide little obstruction on the lower side of the nail array, so that access to both upper and lower sides of nail array **10** is allowed.

Supporting the conveyor straps **5** and **6** are respective pairs of identical sprocket wheels **8** and **8***a*, and **9** and **9***a*, together with respective vertical drive shafts extending transversely to the direction of the straps. The conveyor straps **5** and **6** are looped at one end about sprockets **8** and **8***a* respectively, which are located adjacent track assembly **3** and feeder **2,** while at the opposite end, the straps **5** and **6** are looped about sprockets **9** and **9***a* respectively. The conveyor straps are driven by means of drive shafts **17***a* and **17***b* mounting sprockets **8** and **8***a* respectively. Drive shafts **17***a* and **17***b* also carry respectively a pair of identical engaged spur gears **19***a* and **19***b*, and shaft **17***b* is connected at one end through transmission **21** to motor **25.** Thus, operation of motor **25** drives strap **6,** and through spur gears **19***a* and **19***b*, also drives strap **5** synchronously therewith.

As the nails are positioned on the straps **5** and **6** from track **3,** they are moved by the conveyor through the remaining stations. Reference may also be made to FIG. **2** which shows stations III to VII in greater detail. Prior to arriving at station III, the array **10** is pre-heated to approximately 400° to 600°F. by electric infra-red radiation heaters, one of which is shown schematically at **16.** The array **10** of nails moves beyond heater **16** to station III, where a rotary power tape feed device **18** directs the strip **14** of plastic tape upon the underside of the moving nail array **10,** with the strip being applied generally midway of the nail shanks **12** and transversely to the axes of the shanks (typically at the aforementioned 60° angle) and along the direction of movement of the array.

The thickness of the strip **14** preferably but not necessarily is related to that of gaps **13** so that the strip is substantially half as thick as one of gaps **13.** As may best be seen from FIG. **2,** tape strip **14** initially lies along the tangents of the nail shanks and immediately begins to adhere to the heated nails at its tangent point of contact therewith, since the tape has thermoplastic and adhesive qualities. One example of such tape which has been found to be particularly useful with steel nails, since it adheres strongly to metal, is of an ethylenepropylene terpolymer material, manufactured by the Standard Oil Comapny of New Jersey, and is 0.008 inch thick and three-fourths inch wide.

Immediately upon application of lower strip **14** to the underside of the array, the array arrives at station IV, downstream of feed device **18,** under a vacuum funnel **20** and over a low pressure hot air blower **22,** which applies a positive adhering force to strip **14** and gradually urges the tape strip **14** more completely around the nail shanks **12.** Blower **22** is positioned just below the conveyor **4** and the conveyed nail array and immediately adjacent the output side of tape feed device **18.** The blower is provided with a heating element **24** preferably heating the air therein to 350°F. Nozzle **23** has an enlarged width that encompasses a plurality of nails simultaneously, so that each nail shank spends a relatively large time in transit over the blower to allow the strip to be softened and gradually formed about the shanks **12.**

Vacuum funnel **20,** placed directly over the conveyor **4** and nail array **10** to cooperate with blower **22,** is even more extensive, in that it extends beyond the nozzle **23** of blower **22** on both sides thereof and also partially overhangs tape feed device **18.** The combined action of vacuum funnel **20** and blower **22** is sufficient both to retain the tape strip against the nail array and to begin the formation of the strip about the shanks and therefore the pre-heating of the nails is not essential. This is particularly so in the case of tape with superior adhesive qualities.

In this manner nail shanks **12** immediately after application of lower tape strip **14** come under the influence of the vacuum applied by funnel **20,** and then under the influence of both blower **22** and vacuum funnel **20** together, thereby insuring a positive adhering force upon the tape. The vacuum is adjusted to the equivalent of 10 inch of mercury, while the blower **22** applies a pressure of the equivalent of 0.02 inch of mercury. The pressure applied by blower **20** is kept low so as to obviate the risk of the strip moving laterally along the nail shanks before it has had a chance to adhere properly to a significant portion of the periphery of the shanks.

The tape strip **14** almost immediately begins to be deformed upwardly into gaps **13** between the shanks, and into more complete contact with the shank periphery under the combined influence of the upward force exerted by the air from blower **23,** the heat carried by such air, the heated condition of the nails themselves, and finally the upward pull exerted by the vacuum of funnel **20** on the strip **14.** This combination of influences gradually shapes lower strip **14** to impart a marked corrugated appearance.

As the nail array **10** with strip **14** is conveyed beyond blower **23** and passes out from vacuum funnel **20,** it passes over a high pressure and high velocity blower **26** provided with a tapered narrow nozzle jet **27,** a heating element **30,** and an air supply regulator **31.** Blower **26** is positioned immediately below the conveyed array and to one side of blower **22** just beyond funnel **20.** The blower **26** directs a comparatively narrow stream of heated air, preferably at 560° F. and at a high pressure, preferably 10 inches of mercury, upwardly against the tape strip **14,** to insure that it is forced well within gaps **13.** The combined effect of such high pressure and the heat, together with the forming previously effected, finally results in the formation between each adjacent pair of nail shanks of a marked fold of generally V-

shaped configuration extending inwardly into each gap. This completes the forming and engagement of strip **14** about a substantial fraction of the lower half of the circumference of each of the nail shanks, so that with the emergence of the nail array from station IV, the shanks of the nails are half-enveloped at their position medially of the shanks.

The partially-enveloped nail strip is next conveyed to station V where a power tape feed device **32** similar to device **18** now dispenses a tape strip **34** similar to strip **14.** Tape strip **34** is directed by feed device **32** upon the upper side of nail array **10** generally midway of the nail shanks **12** along the direction of travel of the array **10,** and in registration with the lower tape strip **14.** At the following station VI, a blower **36,** similar to blower **22,** is positioned above the conveying array and immediately adjacent the output side of tape feed device **32.** The blower also includes a heating device **38** that operates at a low pressure and about 350° F., which is a temperature similar to that of blower **22** to form the tape strip **34** into a corrugated form about the upper half of the circumference of nail shanks **12** as they pass under blower **36.** The nozzle **40** of the blower is relatively wide so as to encompass simultaneously a plurality of nail shanks, so that each nail shank spends a relatively large time interval in transit under blower **36** to allow the strip **34** to be softened and gradually formed about the nail shanks **12** under the influence of the emerging heated air.

As the nails emerge from beneath blower **36,** they are brought under the influence of two high velocity and pressure heated-air blowers **42** and **44** serially disposed adjacent blower **36** above the conveyed array. Both are similar to high-pressure blower **26,** and include respective tapered narrow jet nozzles **45** and **46** directing a narrow high pressure stream of air against upper tape strip **34.** Both units include respective air supply regulators **48** and **50** and preferably operate at a pressure of 10 inches of mercury. Blower **42** includes a heating element **52** which heats its output air preferably to about 350° F., and blower **44** includes a heating element **54** which heats its output air preferably to a temperature of about 560° F. The effect of the last two high-pressure air streams acting downwardly on the strip **34** is to complete the shaping of the upper strip **34** about a substantial fraction of the upper half of the nail shank peripheries.

Thus, the heated air stream from blower **42** completes the forming of strip **34** around the upper half of the nail shank peripheries begun by blower **36.** The heated air stream from blower **44** insures that strip **34** has been heated and urged downwardly sufficiently into gaps **13** between the shanks. Again, a generally V-shaped fold is thereby defined in the upper tape strip **34** between adjacent pairs of nail shanks and extending inwardly into each gap, in opposed relationship to the fold in the lower strip **14,** but spaced therefrom. This completes the formation about the nail array **10** of a unitary carrier body **56.**

Of course, the air pressure, size, numbers and location of the blowers and the operating temperatures, or any of these factors, may be adjusted to accommodate different plastic materials or produce varying degrees of corrugations in the tape strips. With the appropriate temperature and tape, for example, the plastic material may be melted or flowed into gaps **13.** If desired, a lesser degree of folding and less tape material may be forced within gaps **13.** Conversely, even greater amounts of tape material may be forced within gaps **13,** and tapes **14** and **34** may even be forced into fusing contact therewithin. However, as set forth in the aforementioned copending application of L. S. Shelton for "Fastener Strip," it has been found that the V-shaped fold within the gaps **13** is desirable in order to provide sites promoting clean shearing of individual fasteners together with associated tape material from the remainder of the nail strip.

The now-completed nail strip is then moved to station VII and over a cooling blower **58** which causes the carrier body about each of the shanks to fully set, in preparation for the cutting of the continuously-formed nail strip into lengths of convenient size. However, blower **58** is not essential, since the finished strip may be brought to a fully-set state at room temperature. The function of cutting the finished nail strip is performed by a cut-off blade **60** positioned vertically over the emerging nail strip by a solenoid **62,** which operates upon command to drive the cut-off blade **60** downwardly into one of the gaps **13** to cut the strip into convenient lengths or sticks, such as is illustrated in FIG. **3.**

The finished sticks are then dropped off the end of conveyor assembly **4** upon a conventional conveyor **65,** which includes a horizontal belt **67,** a drive roller and shaft **69,** and a belt drive **72** by which motor **74** drives the roller **69** and thereby the belt. In this manner, as each finished stick emerges at the outlet end of conveyor **4,** it is moved away to a storage or receiving area in continuous fashion.

It should be noted that the invention is not confined to use with modified nails, but may instead also utilize full-headed common nails, when provided with an appropriate collating apparatus at station I. Also the spacing of the gaps between adjacent shanks is not necessarily a small fraction of the diameter of the shanks, and indeed must be much larger if the invention is used with full-headed nails. The same conveyor assembly may be used, except that the notches in the conveyor straps are spaced farther apart to define a wider spacing, or any other conveyor assembly may be used which allows access to opposite sides of the nail array and maintains the nail shanks in spaced relationship.

Still other variations could be incorporated without departing from the invention. For example, either the upper or lower tape strips could be of a greater width than the opposite tape strip. Also, since the plastic tape has both adhesive and thermoplastic qualities, either the upper or the lower tape could well be eliminated completely, and the invention would still form an array of nails into a completed nail strip. Moreover, instead of the nail array being conveyed, the array may be kept stationary on a suitable jig or support which maintains the nails in spaced relationship, while the tape dispensing means, and the various air blowers and vacuum funnel are instead moved with respect to the nail array.

The apparatus is capable of substantially continuous operation, requiring only supplies of plastic tape, nails, and pressurized heated air. The process does not give off fumes or other toxic substances which might be harmful to the personnel operating the equipment as well as the environment as might be the case with adhesive systems using solvent. The great advantage of the invention is that at no point is the plastic strip contacted by anything other than air jets, once it has been

deposited on the nail array, so that all the problems of jamming and adherence of material to mechanical parts of the apparatus types usually used in the manufacture of nail strips similar to that contemplated herein, are avoided. The uniformity of the tape thickness about each shank consequently is at an optimum level; also, a minimum of cooling steps are required. The invention thus radically simplifies the manufacture of nail strips, and makes possible an increased volume of production, while improving reliability of the quality of the finished product.

I claim:

1. Fastener strip assembly apparatus for use with a thermoplastic tape having adhesive properties, and fasteners with elongated shanks, said apparatus comprising: conveying means for maintaining said fasteners in side-by-side spaced relationship to define a flat parallel array having gaps between said shanks, and for moving said array in a direction transverse to said shanks; first and second tape dispensing means for directing first and second strips of said tape transversely across said shanks on opposite sides of said fastener array; and means for forcing heated air upon both strips so as to urge siad strips inwardly into said gaps between said shanks and into adhering contact with said shanks, thereby enveloping at least a portion of each shank and joining said array together to form a unitary fastener strip.

2. Fastener strip assembly apparatus as in claim 1, which also includes means for heating said fasteners prior to the placement of said tape strips onto said array.

3. Fastener strip assembly apparatus as in claim 1, which also includes means for cooling said fastener strip.

4. Fastener strip assembly apparatus as in claim 3, which further includes means for cutting said fastener strip into sections.

5. Fastener strip assembly apparatus for use with metal-adherent thermoplastic tape and fasteners with elongated shanks, said apparatus comprising: means for collating said fasteners and feeding said fasteners to an outlet; means accepting said fasteners from said outlet and maintaining said fasteners in a flat parallel array having uniform gaps between said shanks and for moving said array in a direction transverse to the shank axes to first and second assembly stations; first tape dispensing means at said first station for directing at least a first strip of said tape upon at least one side of said array transversely across said shanks generally in said direction of movement of said array; first means at said second station for forcing heated air upon siad strip so as to urge said strip inwardly into said gaps between said shanks and into adhering contact with said shanks, and means downstream of said tape dispensing means for applying a vacuum to said first tape strip to aid in urging said tape strip into said gaps between said shanks, thereby enveloping at least a portion of each shank and joining said array together to form said unitary fastener strip.

6. Fastener strip assembly apparatus as in claim 5, in which said first heated air forcing means includes a first low velocity blower unit cooperating with said vacuum means to direct heated air against said tape strip to soften and form said tape strip about said shank peripheries.

7. Fastener strip assembly apparatus as in claim 6, in which said first heated air forcing means includes a first high velocity blower unit directing air of higher velocity as compared to said low velocity blower against said tape strip to define a fold therein extending inwardly into said gaps and to complete the forming of said tape strip about said nail shanks.

8. Fastener strip assembly apparatus for use with metal-adherent thermoplastic tape and fasteners with elongated shanks, said apparatus comprising: means for collating said fasteners and feeding said fasteners to an outlet; means accepting said fasteners from said outlet and maintaining said fasteners in a flat parallel array having uniform gaps between said shanks and for moving said array in a direction transverse to the shank axes to first and second assembly stations; first tape dispensing means at said first station for directing at least a first strip of said tape upon at least one side of said array transversely across said shanks generally in said direction of movement of said array; and first means at said second station for forcing heated air upon said strip so as to urge said strip inwardly into said gaps between said shanks and into adhering contact with said shanks, a second tape dispensing means for directing a second strip of tape upon the other side of said array in a manner similar to said first tape strip, and a second heated air forcing means for urging said second tape strip inwardly into said gaps similarly to said first tape strip, said second air forcing means including a second low velocity heated air blower for initial forming of said second tape strip, and a second high velocity heated air blower to define a second fold therein extending inwardly into said gaps, said first and second folds providing sites for clean shearing of said fasteners together with associated tape from said strip.

9. Fastener strip assembly apparatus for use with metal-adherent thermoplastic tape, and a plurality of fasteners having elongated shanks, said apparatus comprising: means for pre-heating said fasteners; means for maintaining said fasteners in side-by-side relationship in a flat parallel array having uniform gaps between said shanks, and for moving said array in a direction transverse to said shanks to first and second adhering locations; first adhering means at said first location for joining a portion of the lower half of the periphery of each of said fastener shanks to the adjacent shank, said adhering means including first tape feeding means for directing a first strip of said tape against said lower shank peripheries in tangential contact therewith, and in the direction of movement of said fasteners, and first blower means immediately downstream of said first tape feeding means for directing a stream of heated air against said first strip on said lower shank peripheries to urge said strip into said gaps and into adhesion with said shanks about a substantial fraction of said lower half of said shank peripheries; and second adhering means at said second location for joining a portion of the upper half of the periphery of each of said fastener shanks to the adjacent shank, said second adhering means including second tape feeding means for directing a second strip of said tape against said upper shank peripheries in tangential contact therewith and in the direction of movement of said fasteners, and second blower means immediately downstream of said second tape feeding means for directing heated air against said strip on said upper shank peripheries to urge said strip into said gaps into adhesion with a substantial fraction

of the upper half of said shank peripheries, and into contact with said lower strip, thereby enveloping a portion of each of said fastener shanks and forming a fastener strip.

10. Nail strip assembly apparatus for use with thermoplastic tape and a flat parallel array of nails having elongated cylindrical shanks disposed side-by-side and defining uniform gaps between said shanks, each of said nails being provided with an enlarged head having a chord section slightly spaced from the periphery of the corresponding shank, said apparatus comprising: means for conveying said array of nails in a direction transverse to the shank axes, said conveying means maintaining each of said spaces between said shanks to match the spacing of said chord sections of said head from said corresponding shank; first and second tape dispensing means for directing first and second strips of said tape transversely across said shanks respectively upon opposite sides of said nail array; and blower means for forcing heated air upon both strips so as to urge said strips inwardly within said gaps between said shanks into adhesion about said shanks to define a pair of spaced, inwardly-extending generally V-shaped folds within each of said gaps, thereby enveloping at least a portion of each shank and joining said array together to form a unitary nail strip from which individual nails together with associated adhered tape may be cleanly sheared.

11. A method of joining together fasteners having elongated shanks to obtain a fastener strip, comprising: positioning a plurality of fasteners with said shanks in a side-by-side parallel array so as to define narrow gaps between each of said shanks; applying first and second strips of thermoplastic tape having adhesive properties transversely and tangentially across the shanks of said array on opposite sides thereof; and directing heated air under pressure against both said first and second strips to deform said strips from their tangential position into said gaps between said shanks and about the periphery of said shanks to form said fastener strip.

12. A method as in claim **11**, which includes the further step of providing a vacuum acting on one of said strips to pull said strip into contact about the peripheries of the fastener shanks.

13. A method as in claim **11**, in which said heated air is initially directed against said strips at low pressure immediately upon application of said strips to said fastener shanks to soften and form said strips about said shanks.

14. A method as in claim **13**, in which said heated air is subsequently directed against said strips at high pressure to define a pair of spaced generally V-shaped folds within each of said gaps extending inwardly therein.

15. A method as in claim **14**, in which one of said strips is subjected serially to said low pressure heated air and to said higher pressure heated air prior to applying the other of said strips to said array.

16. A method as in claim **11**, which further includes the step of heating said fasteners prior to applying said first and second strips.

17. A method of joining together fasteners having elongated shanks to obtain a fastener strip, comprising: positioning a plurality of fasteners with said shanks in a side-by-side parallel array so as to define uniform narrow gaps between each of said shanks; applying at least one strip of thermoplastic tape transversely and tangentially across the shanks of said array on at least one side thereof; directing heated air under pressure against said strip to deform said strip from its tangential position into said gaps between said shanks and about at least a portion of each shank to form said fastener strip, and providing a vacuum acting on said tape strip to further urge said strip into said gaps between said shanks.

18. A method of joining together a plurality of nails each having an elongated cylindrical shank and an enlarged head having a chord section slightly spaced from the periphery of the corresponding shank to obtain a nail strip, comprising: positioning a plurality of said nails with said shanks in a side-by-side parallel array so as to define uniform narrow gaps between each of said shanks matching the spacing of said chord section of said head from said corresponding shank; applying first and second strips of thermoplastic tape transversely and tangentially across the shanks of said array on respective opposite sides thereof; and directing heated air under pressure against both said first and second strips to deform said strips from their tangential position into said gaps between said shanks and about the periphery of said shanks to form said nail strip.

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