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NAIL TRANSFER AND COLLATING MEANS

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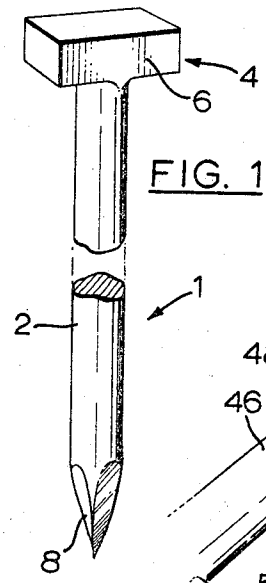

FIG. 1

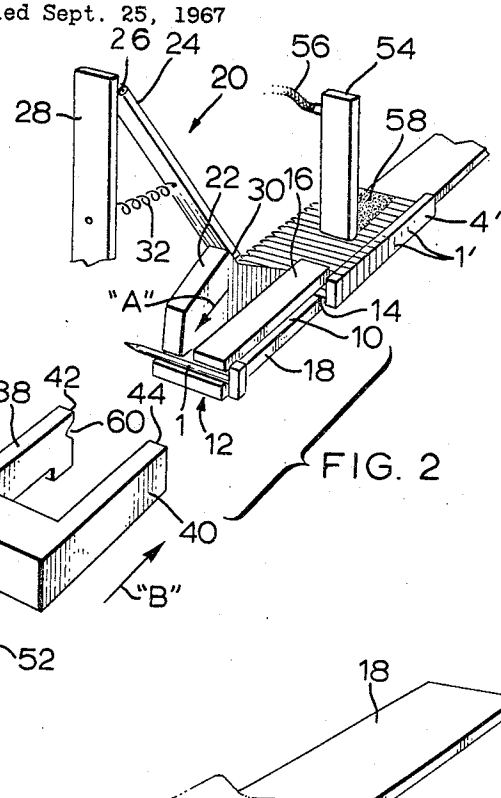

FIG. 2

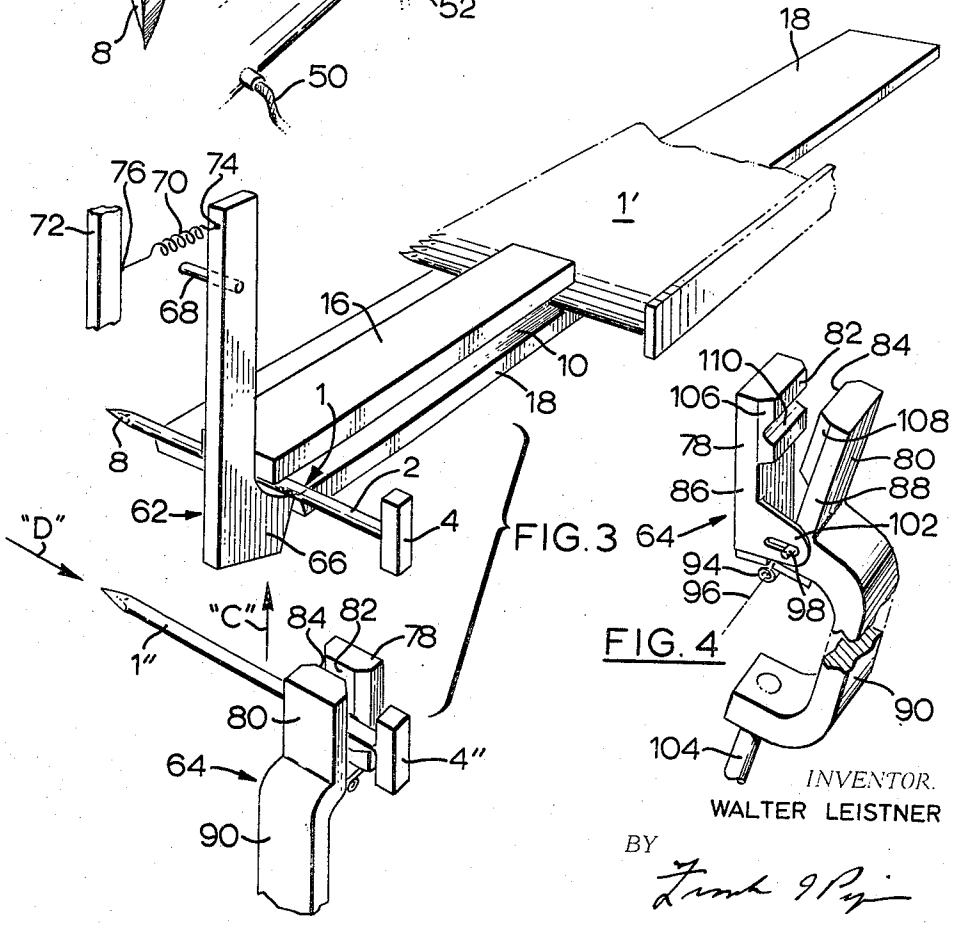

FIG. 3

FIG. 4

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NAIL TRANSFER AND COLLATING MEANS

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ABSTRACT OF THE DISCLOSURE

Apparatus for transferring nails from a nail supply station to a stick-forming station having a nail transfer means comprising a pair of jaws with opposite engaging surfaces between which a nail is received at the nail supply station and held for transfer to an input end of a nail channel where the nail is disengaged from the jaws of the transfer means and a lateral moving means comprising a bifurcated arm which moves the nail from the input end to the stick-forming station past a nail abutting means that prevents any free translation and rotation of the nail.

The present invention relates to collating devices for forming sticks of nails and more particularly to transfer and collating devices for transferring nails from a nail supply station to a stick-forming station.

The use of sticks of nails or staples in both hand- and pneumatically-operated tools is well established. In order to produce such sticks of nails, it is necessary to align said nails in contiguous or stick relationship with each other and then to bond them together. In general, an adhesive is used for this purpose.

When it is desired to form sticks of nails, it is necessary to utilize nails with a particular type of head formation. The nails which are used for this purpose comprise elongated cylindrical shanks with transversely disposed heads having diametrically opposed straight-sided parallel faces which are substantially tangential to the cylindrical shanks. When such nails are placed with such parallel faces of their heads in side by side contiguous relationship with each other, the shanks of adjacent nails are also contiguous with each other and an efficient bonded stick formation is obtained on the application of the adhesive to the collated unbonded stick of nails.

Various methods have previously been adopted for collating such nails in stick form and one important object of the present invention is to provide a collating device by the use of which such nails can readily be collated into such stick formation.

A very important advantage of the collating devices of the present invention is that they can be used in cooperation with nail-manufacturing machines, the nails being transferred individually and immediately after their manufacture from the nail-manufacturing machine to a stick-forming station. In this way, advantage may be taken of the fact that the nails are available from the nail-manufacturing machine with a fixed axial orientation, i.e. with their axially asymmetrical heads always disposed in the same direction. In this way, the previous need for axially aligning the nails prior to their collation into stick form is avoided thereby considerably simplifying the collation operation. When the collating devices of the present invention are to be used with existing nail-manufacturing machines, it will generally be necessary

additionally to utilize a nail-transfer device since it will generally be impossible to include the collating devices themselves in the restricted space available at the nail supply point of such existing machines. The present invention also provides nail transfer and collating devices which are suitable for use in conjunction with existing nail-manufacturing machines.

In its broadest aspect, a collating device in accordance with the present invention comprises:

(a) A nail channel having an input end and an output end and defined by two members between which said nails are transported, the widths of said members being such that the head of a nail in said channel and the end of said nail remote from said head of said nail project beyond said members,

(b) Frictional nail-abutting means for abutting said nails in said nail channel substantially to prevent undesired free translation and rotation of said nails in said nail channel,

(c) A stick-forming station at said output end of said nail channel for receiving nails from said nail channel in contiguous relation to each other,

(d) Lateral moving means for engagement at said input end of said nail channel with a nail disposed therein so that its head is substantially perpendicular to said nail channel, for moving said nail from said input end of said nail channel to said output end of said nail channel with substantially no rotation of said nail, and for delivering said nail at said output end of said nail channel with the nail in a disposition substantially contiguous with an adjacent nail in said stick-forming station, and

(e) Drive means for reciprocally driving said lateral moving means between said input end and said output end of said nail channel.

Although the lateral moving means for moving nails along the nail channel may have many different constructions, it may conveniently comprise, for instance, a bifurcated arm having two arm-terminating nail-engaging faces, the first of said nail-engaging faces comprising a flat surface for abutting one of said straight-sided parallel faces of the head of a nail at said input end of said nail channel and the second of said nail-engaging faces comprising a groove for abutting the shank of said nail at said input end of said nail channel. A particularly important advantage of the use of this type of lateral moving means is that undesired rotation of a nail in the nail channel is substantially completely eliminated as a result of the engagement of the arm-terminating flat surface with one of the straight-sided parallel faces of the nail head.

As previously stated, undesired free translation and rotation of the nail in the nail channel is prevented by the frictional nail-abutting means. Such nail-abutting means can, for instance, comprise a spring-loaded member adapted to bear on the shank of a nail in said nail channel substantially to prevent said undesired free translation and rotation of said nail. It should be stressed that, although such nail-abutting means substantially prevents free translation of a nail in the nail channel, it does not prevent the desired translational movement of the nail along the nail channel under the influence of the lateral moving means. Such translational movement occurs against the frictional forces applied by the nail-abutting means and consequently the nail is held by such frictional

forces in constant engagement with the nail-engaging surfaces of the lateral moving means, which engagement, as previously explained, prevents any significant undesired rotation of the nail out of its existing axial orientation which is essential in order for the nails to be aligned in contiguous relation with each other for stick-formation.

If the collating devices of the invention can be used in conjunction with a nail-manufacturing machine without the additional use of a nail transfer device, the nail channel will be positioned so that a nail is located in the input end of the nail channel prior to completion of its manufacture. For instance, in the case of machines in which the final step of the nail manufacturing operation is the servering of the nail from the wire feed with the simultaneous formation of the nail point, the nail will be positioned at the input end of the nail channel prior to such severing operation so that, when such severing operation is effected, the existing axial orientation of the nail will be retained by virtue of its engagement with the aforementioned frictional nail-abutting means.

If desired, the collating devices of the present invention can be provided with a nail-engaging means at the input end of the nail channel. Such nail-engaging means are adapted to receive and engage nails individually with their heads substantially perpendicular to said nail channel but to allow said nails to be disengaged therefrom on actuation of said lateral moving means in the direction of from said input end to said output end of said nail channel. Such a nail-engaging means may comprise a spring-loaded pawl-like lever adapted to be displaced when a nail is inserted in said input end of said nail channel and then to engage said nail at said input end until actuation of said lateral moving means in the direction of from said input end to said output end of said nail channel.

Although such use of nail-engaging means may be advantageous in cases where the nails are fed to the collating device either directly from a nail-manufacturing machine or from another source of nails, the principal advantage of such a nail-engaging means is obtained when the collating device is used in conjunction with a nail transfer device for transferring nails individually from a remote nail-supply station to the input end of the nail channel of the collating device, as is the case when, for any reason, it is impossible to locate the collating device at the nail supply point of an existing nail-manufacturing machine.

In such a case, a nail transfer means is combined with a collating device having a nail-engaging means to provide a combined transfer and collating device. In such a combined device, the nail transfer means receives nails individually from a nail supply station in a fixed predetermined axial orientation and is adapted for reciprocal movement between said nail supply station and said input end of said nail channel to supply the nail to said channel in a predetermined axial orientation. The nail-engaging means at the input end of the nail channel is adapted to receive and engage the nails from the nail transfer means with the head of the nail substantially perpendicular to the nail channel and to disengage the nail from the nail transfer means. The nail-engaging means is also adapted to permit disengagement of a nail therefrom on movement of the lateral moving means as previously described. Such a combined transfer and collating device will also be provided with a drive means for driving said nail transfer means in reciprocal motion between said nail supply station and said input end of said nail channel and for reciprocally driving said lateral moving means between said input end and said output end of said nail channel, in sequence such that, after engagement of an individual nail by said nail-engaging means and disengagement of said nail from said nail transfer means, said lateral moving means is actuated to move said nail from said input end to said output end of said nail channel.

The particular construction and form of the nail transfer means will depend to some extent on the design of a nail-manufacturing machine with which it is desired to utilize the transfer and collating device of the invention but it has been found that highly effective operation can be obtained by the use of a nail transfer means which comprises a pair of jaws having opposed engaging surfaces between which a nail is received and held for transfer from said nail supply station to said input end of said nail channel and from which said nail is disengaged on movement of said nail transfer means away from said input end of said nail channel.

The invention will now be described by way of illustration with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of the type of nail which can be collated into stick form in the devices of the present invention;

FIGURE 2 is a simplified fragmentary perspective view of a collating device according to the invention with certain parts omitted to assist in comprehension of the essential features;

FIGURE 3 is a simplified fragmentary perspective view of a transfer and collating device according to the invention with certain parts omitted to assist in comprehension of the important features; and

FIGURE 4 is a distorted and enlarged fragmentary perspective view of a preferred form for the nail transfer means for use in the nail transfer and collating devices of the invention.

From FIGURE 1, it will be seen that nails generally indicated at **1** which are collated in the devices of the invention comprise a generally cylindrical shank portion **2** and a transversely disposed head, generally indicated at **4**, having diametrically opposed straight-sided parallel faces **6** which are substantially tangential to the shank **2**. The nail illustrated in FIGURE 1 also has a pointed end generally indicated at **8**. It will be appreciated that the design of the nail can be different from that shown in FIGURE 1 provided that the nail has a head of the type illustrated with opposed straight-sided faces which are substantially tangential to the shank of the nail.

Referring now to FIGURE 2, it will be noted that the collating device comprises the following important components:

(a) A nail channel **10** having an input end **12** and an output end **14** and defined by an upper flat member **16** and a lower flat member **18** between which a nail **1** is transported. The upper flat member **16** is shorter and narrower than the lower flat member **18** for reasons that will become apparent later;

(b) A frictional nail-abutting means generally indicated at **20** and comprising a bearing block **22**, the lower surface of which is held in frictional engagement with the shank of the nail **1** by means of a lever **24** pivoted at **26** to an upright frame member **28** of the collating device. The upright frame member **28** is shown in fragmentary form for the purpose of simplifying the drawing. Lever **24** is held against a bearing surface **30** on top of bearing block **22** by means of a tension spring **32** secured to both the lever **24** and the upright **28**. The force applied to the nail **1** by the bearing block **22** is directed both downwardly and towards the input end **12** of the nail channel **10**, i.e. approximately in the direction of the arrow "A," thereby preventing the nail from moving freely along the channel **10** away from the input end **12**;

(c) A stick-forming station located at the output end **14** of the nail channel **10** and in which the nails **1'** are seen with their heads **4'** in contiguous side by side relation;

(d) A lateral moving means generally indicated at **34** comprising a bifurcated arm **36** having two arms **38** and **40** which terminate in nail-engaging faces **42** and **44** respectively.

The bifurcated arm **36** of the lateral moving means **34** is connected to drive means which, in the embodiment illustrated, comprises a hydraulic pump **46**, the piston

(not shown) of which is linked to the arm **36** by means of a connecting rod **48**. By feeding hydraulic fluid into line **50** of pump **46**, movement of arm **36** in the direction of arrow "B" is effected, while feeding fluid into line **52** causes movement of arm **36** in the opposite direction.

It will also be noted that the device of FIGURE 2 is provided with an adhesive-dispensing unit **54** into which adhesive is supplied through line **56**. Adhesive from the unit **54** is applied to the collated nails **1'** in a central band **58** thereby forming a bonded stick of nails. It must, however, be stressed that the present invention concerns a collating device for forming unbonded collated sticks of nails and the application of adhesive to such unbonded sticks forms no part of the present invention.

The device of FIGURE 2 operates in the following manner. With the arm **36** in the position indicated in the drawing, a nail **1** is inserted into the nail channel **10** at the input end **12** with the head **4** of the nail **1** substantially perpendicular to the nail channel **10**. The nail may be placed in position manually or automatically as will be described in more detail hereinafter. Once the nail has been placed in the position shown in FIGURE 2, it is prevented from rotating freely by the force applied by bearing block **22**. The arm **36** is next moved in the direction of the arrow "B" by feeding hydraulic fluid to line **50** of pump **46** and the flat nail-engaging surface **44** of arm **40** engages the lateral face **6** of the head **4** of the nail **1**. Simultaneously, a notch **60** provided in nail-engaging surface **42** of arm **38** engages the shank **2** of nail **1**. Such engagement of the nail by faces **42** and **44** is made possible by the fact that the head and the shank of the nail **1** project beyond the edges of the lower member **18** of the nail channel **10**. On further movement of the arms **38** and **40** in the direction of the arrow "B," the nail **1** is moved along the channel **10** until it reaches the output end **14** where it comes into side by side contiguous relation with the adjacent nail of the previously formed stick of nails **1'**. Movement of nail **1** along channel **10** under the influence of lateral moving means **34** is made against the force applied by bearing block **22** but this force ensures that the nail **1** remains in abutting engagement with faces **42** and **44** of arms **38** and **40** respectively and, in view of this engagement, undesired rotation of nail **1** is substantially completely prevented.

It will naturally be understood that the various parts illustrated in FIGURE 2 will be connected to a main supporting structure of the device but such a structure has been omitted from the drawings to facilitate comprehension of the invention.

As previously stated, nail **1** may be inserted into the input end **12** of the nail channel **10** either manually or automatically. Such automatic introduction of a nail from a nail transfer device will be described hereinafter but it should be noted at this point that it might be possible to insert a nail directly from a nail-manufacturing machine. In such a case, the nail, prior to being severed from the feed wire of the nail-manufacturing machine, can be fed between the members **16** and **18** and then the head **4** formed thereon in a known manner by head-forming means (not shown). Wire-severing means (not shown) would next be actuated to sever the nail from the feed wire and simultaneously form the point **8** on the nail. In this way, nails can be fed in a fully automatic operation from the nail-manufacturing machine to the stick-forming station.

The use of a collating device according to the invention in combination with a nail transfer device is illustrated in FIGURE 3 in which, where applicable, the same legends are used as in FIGURES 1 and 2. In order to simplify the drawings, the lateral moving means **34** and the means by which the nail-abutting force is applied to bearing block **22** have been omitted from FIGURE 3.

The device illustrated in FIGURE 3 additionally comprises a nail-engaging means generally indicated at **62** and a nail transfer means generally indicated at **64**.

The nail-engaging means **62** comprises a pawl-like lever **66** pivoted at **68** to an upright frame member (not shown) and held in engagement with the undersurface of the shank **2** of nail **1** by means of a tension spring **70** connected to said lever **66** at **74** and to an upright frame member **72** at **76**. Upright frame member **72** is shown cut away to simplify the drawing.

The nail transfer means **64** (see also FIGURE 4) comprises a pair of jaws **78** and **80** having opposed engaging surfaces **82** and **84** respectively between which a nail **1''** is received and held for a transfer to the input end **12** of the nail channel **10**. The jaws **78** and **80** are carried at the ends of arms **86** and **88** respectively which in turn are connected to a vertical arm **90** with an offset intermediate portion to permit forming of the head of the next nail while the previous nail is being transferred to the collating device. A compression spring **94** is attached onto the lower ends of arms **86** and **88** thereby pivoting the arms about a pivot point **96** to drive jaw faces **82** and **84** into engagement with each other and to hold securely any nail disposed therebetween. Arms **86** and **88** are connected by slotted flange **102** at **98**. Flange **102** is integral with the arm **86**. The arm **90** is integral with a vertical connecting rod **104** which is in turn connected to the piston of a hydraulic pump (not shown) for moving the transfer means upwardly in the direction of the arrow "C" (FIGURE 3) or downwardly.

It will be noted that the jaws **78** and **80** are bevelled at **106** and **108** respectively to permit the ready insertion therebetween of a nail **1''** as will be more fully explained hereinafter and that the engaging surface **82** of the jaws **78** has a semi-circular groove **110** provided therein to permit easier insertion of the shank of the nail **1''** between the egaging surfaces **82** and **84**. It should be further noted that arms **86** and **88** are transversely chamfered to be narrower adjacent the rear portion of the jaws **78** and **80** so that, when the shank of a nail is engaged between said jaws, the arms **86** and **88** do not engage the head of the nail.

In operation, a nail **1''** is fed into the jaws **78** and **80** from a nail supply station in the direction indicated by the arrow "D" in FIGURE 3. In the construction illustrated, the nail will be fed with its head in the vertical orientation shown. Separation of the jaws **78** and **80** to permit passage of the nail therebetween against the action of spring **94** is facilitated by bevelled surfaces **106** and **108** which also serve to correct any slight axial disorientation of the nail **1''**. On continued movement of the nail **1''** in the direction of the arrow D to the position indicated in FIGURE 3, the head **4''** of the nail **1''** is disposed in the space between arms **86** and **88** and the shank of the nail is engaged between the jaw faces **82** and **84**. The nail is now secure in the nail transfer means **64** and cannot rotate out of its desired axial orientation.

In the case where the nail **1''** is fed to the transfer means **64** at the nail supply station of a nail-manufacturing machine, the severing of the nail from the feed wire will generally be effected after the nail is securely engaged between the jaws **78** and **80**. Once the nail is securely engaged between the jaws **78** and **80** and any nail severing operation has been effected, the nail transfer means **64** is moved vertically in the direction of the arrow "C" by the hydraulic pump (not shown) until the shank of the nail engages with the pawl-like lever **66**. Continued upward movement of the nail transfer means **64** forces lever **66** to pivot at **68** and permits the nail to move into the position indicated at **1** at which time the pawl-like lever **66** returns to the position illustrated under the action of spring **70**. At this time, the hydraulic pump (not shown) causes the nail transfer means **64** to commence moving downwardly to its original position. The nail is, however, retained in the position indicated at **1** by the pawl-like lever **66** and consequently jaws **78** and **80** are forced apart against the action of spring **94** to permit

the nail to be disengaged from between the jaws. The nail transfer means then continues its downward movement to its original position to receive a further nail while the nail in the position 1 is ready to be moved through the nail channel 10 by the lateral moving means 34 described in connection with the device of FIGURE 2 but not shown in FIGURE 3.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. A collating device for forming sticks of nails, each of which comprises an elongated cylindrical shank with a transversely disposed head having diametrically opposed straight-sided parallel faces substantially tangential to said shank, which collating device comprises:

a nail channel having an input end and an output end and defined by two members between which said nails are transported, the widths of said members being such that the head of a nail in said channel and the end of said nail remote from said head of said nail project beyond said members,

frictional nail-abutting means movably mounted along one side of said channel and oriented to contact and engage said nails along their sides in said nail channel substantially to prevent undesired free translation and rotation of said nails in said nail channel,

means normally urging said movably frictional means into frictional nail engagement,

a stick-forming station at said output end of said nail channel for receiving nails from said nail channel in contiguous relation to each other,

lateral moving means for engagement at said input end of said nail channel with a nail so disposed therein that its head is substantially perpendicular to said nail channel, for moving said nail from said input end of said nail channel to said output end of said nail channel with substantially no rotation of said nail, and for delivering said nail at said output end of said nail channel with the nail in a disposition substantially contiguous with an adjacent nail in said stick-forming station, and

drive means for reciprocating driving said lateral moving means between said input end and said output end of said nail channel.

2. A collating device as claimed in claim 1 in which said lateral moving means comprises a bifurcated arm having two arm-terminating nail-engaging faces, the first of said nail-engaging faces comprising a flat surface for abutting one of said straight-sided parallel faces of the head of a nail at said input end of said nail channel and the second of said nail-engaging faces comprising a groove for abutting the shank of said nail at said input end of said nail channel.

3. A collating device as claimed in claim 1 in which said frictional nail-abutting means comprises a bearing block member and a spring-loaded mounting member swingably supported adjacent one side of said channel and permitting said block member to bear on the shanks of nails in said nail channel substantially to prevent said undesired free translation and rotation of same.

4. A collating device as claimed in claim 1 which additionally comprises a nail-engaging means at said input end of said nail channel, said nail-engaging means being adapted to receive and engage nails individually with their heads substantially perpendicular to said nail channel but to allow said nails to be disengaged therefrom on actuation of said lateral moving means in the direction of from said input end to said output end of said nail channel.

5. A collating device as claimed in claim 4 in which said nail-engaging means comprises a spring-loaded pawl-like lever adapted to be displaced when a nail is inserted in said input end of said nail channel and then to engage said nail at said input end until actuation of said lateral moving means in the direction of from said input end to said output end of said nail channel.

6. A transfer and collating device for transferring nails individually from a nail supply station to a stick-forming station, each of said nails being supplied at said nail supply station in a fixed predetermined axial orientation and each of said nails comprising an elongated cylindrical shank with a transversely disposed head having diametrically opposed straight-sides parallel faces substantially tangential to said shank, which transfer and collating device comprises:

a nail channel having an input end and an output end and defined by two members between which said nails are individually transported, the widths of said members being such that the head of a nail in said nail channel and the end of said nail remote from said head of said nail project beyond said members,

a nail transfer means for receiving said nails individually from said nail supply station and adapted for reciprocal movement between said nail supply station and said input end of said nail channel to supply a nail to said input end in a predetermined fixed axial orientation,

frictional nail-abutting means novably mounted along one side of said channel and oriented to contact and engage said nails along their sides in said nail channel substantially to prevent undesired free translation and rotation of said nails in said nail channel,

means normally urging said movable frictional means into frictional nail engagement,

a stick-forming station at said output end of said nail channel for receiving nails from said nail channel in contiguous relation to each other,

lateral moving means for engagement at said input end of said nail channel with a nail disposed therein, for moving said nail from said input end of said nail channel to said output end of said nail channel with substantially no rotation of said nail, and for delivering said nail at said output end of said nail channel with the nail in a disposition substantially contiguous with an adjacent nail in said stick-forming station,

nail-engaging means at said input end of said nail channel, said nail-engaging means being adapted to receive and engage nails individually from said nail transfer means with the heads of said nails substantially perpendicular to said nail channel and so disengage said nails from said nail transfer means but also adapted to permit disengagement of said nails therefrom on movement of said lateral moving means from said input end to said output end of said nail channel, and

drive means for driving said nail transfer means in reciprocal motion between said nail supply station and said input end of said nail channel and for reciprocally driving said lateral moving means between said input end and said output end of said nail channel, in sequence such that, after engagement of an individual nail by said nail-engaging means and disengagement of said nail from said nail transfer means, said lateral moving means is actuated to move said nail from said input end to said output end of said nail channel.

7. A transfer and collating device as claimed in claim 6 in which said nail supply station is a nail-manufacturing machine in which said nails are individually supplied in a fixed axial orientation corresponding to that in which they are manufactured.

8. A transfer and collating device as claimed in claim 6 in which said nail transfer means comprises a pair of jaws having opposed engaging surfaces between which a nail is received and held for transfer from said nail supply station to said input end of said nail channel and from which said nail is disengaged on movement of said nail transfer means away from said input end of said nail channel.

9. A transfer and collating device as claimed in claim 6 in which said lateral moving means comprises a bi-

furcated arm having two arm-terminating nail-engaging faces, the first of said nail-engaging faces comprising a flat surface for abutting one of said straight-sides parallel faces of the head of a nail at said input end of said nail channel and the second of said nail-engaging faces comprises a groove for abutting the shank of said nail at said input end of said nail channel, and in which said frictional nail-abutting means comprises a spring-loaded member adapted to bear on the shank of a nail in said nail channel to prevent said undesired free translation and rotation of said nail.

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