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[54] **NAIL PACKAGE HAVING EXTERIORLY RIBBED RATAINING STRIPS**
11 Claims, 3 Drawing Figs.

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[50] **Field of Search** 206/56

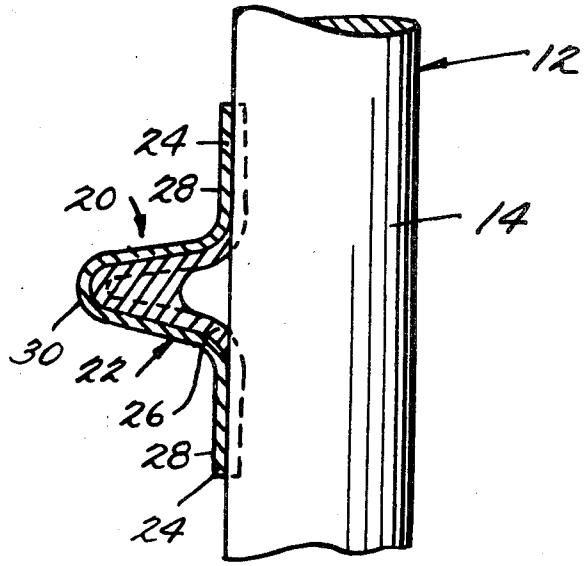
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ABSTRACT: A nail package of the type including a plurality of nails arranged in row formation with their shanks generally parallel and the heads of adjacent nails in lapped relation and a plurality of strips of material for securing the nails in the row formation operable to be progressively disintegrated as the nails are progressively driven from the row formation by a tool. Each of the strips is formed to provide relatively narrow, thin, elongated webs and a longitudinally coextensive central rib, the webs extending longitudinally in the direction of extent of the row formation and transversely in the direction of extent of the shanks and being adhesively secured to the shanks on opposite sides of the row formation, the ribs extending longitudinally in the direction of extent of the row formation and transversely outwardly from the associated webs in a direction transverse to the direction of extent of the shanks.



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Fig. 1.

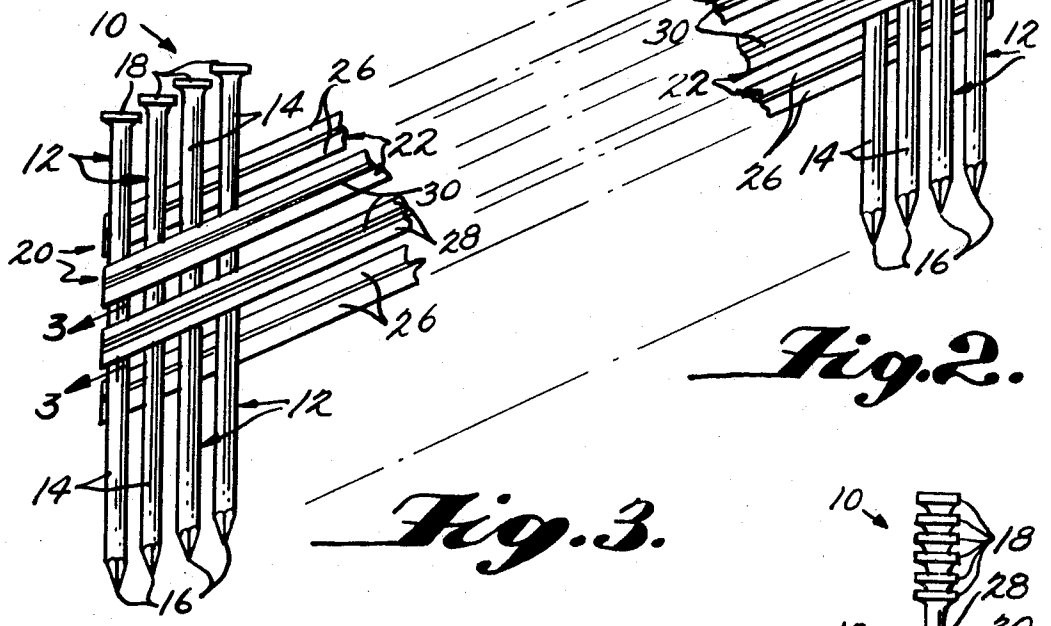
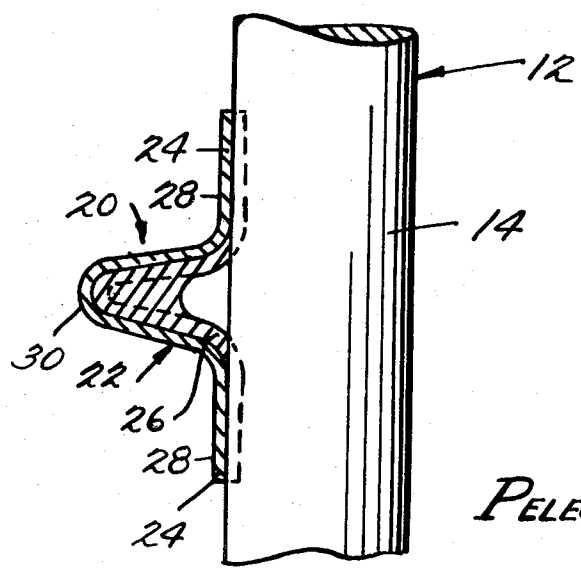
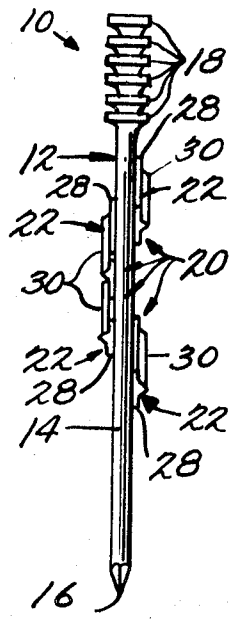


Fig. 2.

Fig. 3.





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NAIL PACKAGE HAVING EXTERIORLY RIBBED RATAINING STRIPS

This invention relates to fastener packages and more particularly to improvements in rigid nail stick packages of the type embodying a plurality of full-headed nails arranged in row formation with their shanks in generally parallel relation and the heads of adjacent nails in lapped relation, which improvements relate to the means for securing the nails in row formation.

There have been many proposals over the years to provide a portable power tool for driving full-headed nails embodying means for mechanically feeding successive nails from a supply into position to be driven. Some tools of this type embody nail-handling mechanisms capable of storing and feeding a supply of nails in loose bulk form. In general, these devices have not proven entirely satisfactory in operation, the nature of the nail-handling mechanisms presenting limitations on the portability and applicability of such tools.

Power operated fastener driving tools which are truly portable and have widespread applicability are usually provided with nail-handling mechanisms which require special nail packages. In general, such packages embody some means for maintaining a supply of nails in a predetermined relation with respect to each other. A common expedient is to utilize some sort of carrier strip or adhesive which serves as a means for retaining the nails together in row formation.

Nail supplies which are retained together by a carrier strip have, in general, been packaged either in coil formation or straight stick formation. In a coil nail package, the carrier strip means retains the nails in a row in which adjacent nails are parallel to one another with the heads in side-by-side relation, the carrier strip means being flexible so as to permit the row of nails to be wound up into a coil formation wherein it is retained as a package. In a straight stick nail package the carrier strip means retains the nails in a row in which adjacent nails have their heads disposed in lapped relation, the carrier strip means being relatively rigid so as to retain the nails in a straight row formation.

A coil nail package has the advantage that a relatively large number of nails can be packaged together in a relatively small concentrated volume. Coil nails, however, have the disadvantage that a much more complex and elaborate mechanism for handling the package and feeding the leading nail of the package into the drive track must be provided. A feeding mechanism of this type must be capable of operating on the leading portion of the strip so as to move the leading nail into the drive track and at the same time unwind the strip from the magazine which houses the coil.

In comparison with the coil nail package, a straight stick package does not concentrate the nails in a compact volume but rather extends them in an elongated row, thus presenting a comparative restriction on the number of nails that can be effectively handled in a given package. On the other hand, the mechanism within the tool for handling a straight stick nail package can be relatively simple. Thus, instead of providing a feed mechanism which must be mechanically actuated after each drive stroke to pull the strip adjacent its leading portion, a simple spring feed can be utilized which pushes on the trailing nail of the package to resiliently urge the leading nail into the drive track.

In general it can be stated that coil nail packages have the advantage of providing a greater number of nails per package, thus minimizing downtime due to nail package loading, but have the disadvantage of the necessity of the tool embodying a relatively complex and costly nail feeding and handling mechanism. These advantages outweigh the disadvantages in applications where the supply of nails is rapidly exhausted and downtime for reloading becomes a somewhat costly and bothersome procedure. Applications of this type are usually encountered in smaller size nails. When dealing with larger size nails, as for example, sixteen-penny or the like, in construction work, the supply of nails is not as rapidly exhausted in terms of the overall operation. Moreover, because of weight and size considerations, the full advantages of a coil of a coil package insofar as numbers of nails are concerned, cannot be secured. Consequently the utilization of a straight stick package appears to provide more overall advantages in such tools for driving large nails.

Straight stick nail packages are well known in the art and the means for retaining the nails in such packages have taken many forms. The most acceptable form of such retaining means utilizes carrier strip material which is progressively fractured or disintegrated by the driving action of each nail. In general, two types of nail-retaining means capable of such progressive disintegrating action have been utilized in these packages. In one type, the nail retaining means is applied to the shanks of the nails in the form of a flowable thermoplastic material. The thermoplastic material is then hardened, the hardened thermoplastic material being confined to the space between the shanks by a pair of thin paper strips extending tangentially to the shanks along each side of the row formation in contact with the hardened thermoplastic material. In a second type, the nail retaining means is in the form of a pair of adhesive tapes, the adhesive of each tape preferably being of a heat activated material such as hot melt or the like. The tapes are applied tangentially to the shanks on opposite sides of the row formation and the adhesive is heat activated, as by preheating the shanks.

Each of these two types of straight stick nail packages has advantages and disadvantages A disadvantage of a straight stick nail package embodying a hardened thermoplastic material nail-retaing means is that a substantial volume of thermoplastic material filling the space between adjacent nails must be fractured and disposed of as each nail is driven. In the normal operation of the tool, the volume of thermoplastic material which extends between the leading nail and the next adjacent nail is stripped from the nails during the driving action. In some instances this stripped material may end up beneath the head of the driven nail, presenting an undesired result. In other instances, particularly in those situations where the tool is being used continuously in one location, the fragments of thermoplastic material can build up on the floor where they become in effect little ball bearings, which may create a severe hazard to personnel.

A straight stick nail package embodying tangentially applied adhesive tapes as the nail-retaining means obviates this disadvantage in that less material is provided between adjacent nails and this material is in sheet or tape form which, when fractured or disintegrated during the driving of the leading nail, is not in a form which would give rise to the ball bearing action previously discussed.

While the tangentially applied adhesive tape nail retaining means obviates the waste problem, other disadvantages are inherently presented which do not present themselves in the hardened thermoplastic material arrangement. These disadvantages relate to the driving action of the leading nail and the resulting tendency for nail misalignment and jamming to occur.

This tendency results from the fact that there is no body of carrier strip material positioned directly between adjacent shanks that will compressively resist the tendency of the shanks to move together as the leading nail is driven. On the contrary, the tangentially applied adhesive strips tend to buckle due to insufficient compressive strength during the initial driving movement of the leading nail, resulting in a tendency for the shanks of the leading nail and the next adjacent nail to move together by virtue of the buckling action. This tendency for the shanks to move together during the initial driving action can result either in the leading nail becoming longitudinally misaligned within the drive track or, in some instances, in the next adjacent nail actually being pulled into the drive track and creating a jamming condition.

It is an object of the present invention to provide a nail-retaining means of the type described for a straight stick nail

package which substantially secures the advantages of the prior art arrangements while substantially obviating the disadvantages thereof.

In accordance with the principles of the present invention, this object is obtained by providing a plurality of strips of material which are operable to be progressively disintegrated as the nails are progressively driven from the row formation, which strips are formed to provide relatively narrow thin elongated web means and longitudinally coextensive rib means. The web means extend longitudinally in the direction of extent of row formation of the nails and transversely in the direction of extent of the shanks and are adhesively secured to the associated sides of the shanks. The rib means extend longitudinally in the direction of extent of the row formation and transversely outwardly from the web means of the associated strip in a direction transverse to the direction of extent of the shanks. With this arrangement, the rib means serve to provide an optimum compressive strength to the package maintaining the shanks of adjacent nails in properly spaced relation and thus more effectively resisting the tendency of the shanks to move toward one another during the driving action.

Since the rib means are disposed outwardly of the shanks on each side of the row, they provide at least a pair of spaced continuous downwardly facing surfaces by which the package can be effectively supported within the magazine for longitudinal sliding movement. In addition, the portions of the rib means extending between the leading nail and the next adjacent nail can be supported along shearing edges thus insuring that the rib means will be separated by the initial driving movement and the adjacent web means extending between the leading nail and the next adjacent nail properly disintegrated. Moreover, with this supporting relationship the tendency for nail misalignment and jamming is materially reduced by eliminating the tendency for the buckling type of action to take place.

Still another object of the present invention is the provision of a nail package of the type described having an improved nail-securing means which provides a desirable lateral flexibility in the package as a unit, thus resisting breakage as by impact blow, such as when the package is dropped or the like, while at the same time providing a desirable frangible or brittle characteristic which will insure optimum progressive disintegration of the carrier strip as the nails are progressively driven from the row formation.

Another object of the present invention is the provision of a nail package of the type described having an improved nail-securing means which provides optimum operating characteristics with minimum amount of material in adhesive contact with the nail shanks to thereby insure maximum coating integrity to the shanks of the nails of the package when coated.

Another object of the present invention is the provision of a nail package of the type described having improved nail-retaining means which is effective in operation and economical to manufacture.

These and other objects of the present invention will become more apparent during the course of the following detailed description and appended claims.

The invention may best be understood with reference to the accompanying drawings wherein an illustrative embodiment is shown.

In the drawings:

FIG. 1 is a fragmentary side elevational view of a nail package embodying the principles of the present invention;

FIG. 2 is an end view of the package shown in FIG. 1; and

FIG. 3 is an enlarged fragmentary sectional view taken along the line 3–3 of FIG. 1.

Referring now more particularly to the drawings, there is shown therein one embodiment of a nail package, generally indicated at 10, embodying the principles of the present invention. As shown, the package includes a multiplicity of common round head nails 12, each including an elongated cylindrical shank 14 having a point 16 formed on one end thereof and a head 18 formed on the opposite end thereof. The nails are arranged in row formation with their shanks 14 disposed in generally parallel relation and their axis in a common plane and with the leading portion of the head 18 of each nail disposed in overlapping relation to the trailing portion of the head of the adjacent nail. Preferably, the trailing edge of the head of each nail is disposed in engagement with the leading surface of the shank of the next adjacent nail or nearly in engagement therewith. The nails 12 are disposed in the row formation by a nail securing or retaining means, generally indicated at 20, which embodies the principles of the present invention.

The nail-retaining means 20 includes a plurality of relatively narrow thin elongated strips 22. As shown, each strip constitutes an adhesive tape which includes a backing portion 24 of fibrous material, such as kraft paper, having an adhesive 26 coated thereon, such as a hot melt material or the like. In the preferred embodiment shown, the backing paper has a thickness of the order of 0.005 inch and the coating a thickness of the order of 0.010 inch. The width of each strip is preferably of the order of seven-sixteeths inch. While a hot-melt-coated kraft paper strip is illustrated as a preferred embodiment, it will be understood that the strip may be made of other materials.

A specific advantage of the preferred material is that the hot melt adhesive is normally nontacky, rendering it capable of being handled prior to assembly in rolls or coils which simplify assembly procedures, and being handled after assembly without the inconvenience of exposed tacky surfaces. The hot melt material has the property that when heated it is converted into a flowable adhesive. The backing material 24 serves to control or confine the flow of the hot melt when heated and the preferred porous material of the backing material has the further advantage that the hot melt material in contact therewith is absorbed within the pores of the material which materially aids in the progressive disintegration of the hot melt material as the nails are stripped from the package. It will be understood, however, that it is within the contemplation of the present invention to utilize strips of a solid adhesive material or laminated, coated or composite strips of other materials having the desired properties.

As best shown in FIG. 3, each strip 22 is folded longitudinally to form web means 28 and coextensive rib means 30 extending transversely outwardly therefrom. As shown, the web means 28 and rib means 30 are preferably of generally T-shaped cross-sectional configuration although it will be understood that it is within the contemplation of the present invention to utilize other cross-sectional configurations, such as angle iron configurations, channel configurations and the like. In the preferred embodiment shown, the rib means is formed by a central longitudinal fold the walls of which are disposed at an included angle of approximately 20°. This angular relationship is considered desirable in that it is more readily accomplished by machinery than a full 180° fold, although the latter is clearly within the contemplation of the present invention. Likewise, the rib means may be of hollow construction such as would be formed by two or more folds.

In the preferred embodiment each strip folded in the manner indicated is then applied alongside the row of nails and head is applied so that the associated side of the shank of the nail becomes imbedded within the hot melt adhesive of the web means. During the heating, the hot melt material adjacent the central fold may flow together to provide a more solid interior within the rib formation.

Also as shown, there are four strips utilized as the nail-securing means, a pair of strips being mounted on each side of the row formation. As shown, the strips are staggered in the direction of the extent of the nail shanks although it will be understood that the strips on opposite sides may be aligned if desired. Moreover, it is within the contemplation of the present invention to utilize as few as two strips and more than four if necessary.

The present invention has applicability to a wide variety of nails including common nails, screw nails, box nails, sinker

nails and the like. As previously indicated, the invention has particular advantages in large size nails, although, the invention is applicable to smaller size nails as well. In this regard, it is contemplated that the same production equipment for manufacturing the packages as well as the tools for handling and driving the nails from the packages could be utilized to accommodate a relatively wide range of sizes as, for example, from eight-penny to sixteen-penny nails. It will be understood, however, that the head diameter size throughout the size range should remain essentially constant (e.g. of the order of 0.305 inch). The shank diameter may vary in size, as, for example from 0.12 inch to 0.15 inch, and the shank length may vary in size, as, for example from 2½inches to 3½inches at one-fourth inch increments.

A constant head size is desirable to insure proper driving throughout the size range by a single tool. Since the leading nail of the package is positioned within the drive track by a spring pressure acting on the trailing nail of the package, the position of the leading nail within the drive track is determined by the engagement of the leading peripheral surface of the head with the wall of the drive track. A constant diameter head serves to insure that the shank of the nail will be positioned within the drive track with its axis substantially coincident with the axis of the drive track. Moreover, since the drive track must be of a diameter to accommodate the diameter of the head maintenance of a constant head diameter size insures proper guiding registry of the head within the drive track during the driving action.

Preferably, the nails would be packaged with the axis of the shanks of adjacent nails being spaced apart the same distance irrespective of the shank diameter size. The maximum spacing is determined by the head diameter size and the largest shank diameter size when in abutment, taking into account manufacturing tolerances. With the preferred arrangement where the largest shank diameter size nail is employed the adjacent peripheries of the head and shank respectively of adjacent nails would be in substantial abutting engagement whereas in packages embodying nails having the minimum shank diameter size within the range there would be a corresponding spacing between the peripheries of the head and shanks of adjacent nails. The term "substantial abutting engagement" and derivatives thereof as herein utilized to describe the relationship between the head and shank respectively of adjacent nails contemplates such range of spacing. It will be understood that with the preferred constant spacing between the axis of adjacent nails the number of nails per unit length of the package remains constant throughout the size range. This constant spacing can be readily obtained in package production equipment capable of accommodating the full size range by collating the nails according to shank axis position.

It will be understood, however, that collating equipment which interrelates the adjacent nails through abutment of the periphery of the heads with the periphery of the shank of the next adjacent nail could be utilized in which case the number of nails per unit length of the package would increase as the diameter size decreases. Under these circumstances, the fastener driving element of a tool adapted to accommodate the entire size range would have to be provided with sufficient relief to accommodate the greatest amount of head overlap as when the shank diameter is the least. The preferred embodiment, while not securing the advantage of greater nail density in the smaller shank sizes of the range, has the advantage of minimizing the relief that must be provided in the fastener driving element thus insuring a greater contact area with the nail during the driving action.

It can be seen that since the nail-retaining means of the present invention utilizes adhesive tapes which are tangentially applied to the nail shanks, the advantages of the tangentially applied adhesive tapes of the prior art over the hardened thermoplastic material nail-retaining means insofar as waste disposal is concerned are secured. Moreover, the exterior rib means formed in the adhesive tapes of the present invention secure significant operational advantages over the straight tapes heretofore utilized in the prior art in tangentially applied adhesive tape nail-retaining means. As previously indicated, these prior art arrangements present a tendency for misalignment and jamming to take place during driving because of a buckling action in the tapes which occurs during the initial driving movement. This action occurs because the leading nail is supported within the drive track solely by the next adjacent nail through the two flat tapes and the next leading nail is supported against longitudinal movement solely by engagement of the head thereof with supporting structure within the magazine. As the leading nail is driven, if immediate full vertical fracture does not occur, the portion of the two flat tapes attached to the periphery of the shank of the leading nail will move longitudinally with respect to the portion attached to the periphery of the shank of the next adjacent nail. Unless the tapes have adequate compressive strength to prevent this movement from taking place prior to fracture, the tapes will buckle causing the shanks to move together in response to the relative longitudinal movement therebetween.

The provision of exterior rib means in the strips prevents this buckling and insures a more efficient driving action with a minimum tendency for misalignment and jamming. First, since the rib means provide downwardly facing surfaces which are exterior to the common tangential planes of the shanks, the magazine assembly can be constructed so as to provide surfaces which engage these downwardly facing surfaces at positions between the leading nail and next adjacent nail. Moreover, these surfaces within the magazine assembly which engage the downwardly facing surfaces provided by the rib means can conveniently terminate in shear edges. With this arrangement therefore, the prior art suspension of the leading nail within the drive track solely by the next adjacent nail through the tape is modified. Thus, with magazine supporting surfaces with shear edges engaging the downwardly facing surfaces of the rib means additional lines of support are provided and any tendency for the strips of the present invention to move downwardly or longitudinally with the leading nail during its driving action is immediately resisted by these magazine supporting surfaces with shearing edges. The result is that the web means is immediately sheared which initiates the disintegration of the strips. Second, the web means provides additional compressive strength which resists the tendency of the strips to buckle prior to complete fracture. This strength is provided both throughout the extent of the strips between their lines of contact with the adjacent peripheries and at the line of contact as well. The addition of strength at the line of contact with the shank is particularly significant since this constitutes the area of weakest strength in the prior art packages where buckling will most readily occur during the driving action.

The exterior rib means of the nail-retaining means of the present invention provides downwardly facing surfaces which can be engaged by supporting structure within the magazine assembly not only at a position adjacent the drive track but throughout the longitudinal extent of the magazine assembly. In this way the package can be supported within the magazine of the continuous smooth surfaces provided by the rib means rather than the irregular discontinuous downwardly facing surfaces of the heads. In those instances where the construction of the magazine assembly is such as to require loading of the package downwardly therein from the top, the package-supporting surfaces within the magazine would engage the rib means of only the lowermost tape on each side of the package throughout the longitudinal extent of the magazine. Where the magazine assembly is end loaded, each of the rib means can be engaged by a supporting surface within the magazine assembly.

Since it is preferable to support the package within the magazine by supporting surfaces which engage the downwardly facing surfaces of the rib means, it is important that the rib means be positioned along the shanks at the same spacing from the head throughout the size range of the shank lengths. Such an arrangement is also desirable from the stand-

point of package production equipment since the positioning of the tapes or strips with respect to the nails can be more readily determined by relating them to the heads. Thus, the only adjustment required in package production equipment to accommodate the full size range is with respect to the shank diameter size. Insofar as accommodation of the shank diameter size within the driving tool is concerned, no adjustment is necessary since the transverse outward extent of the rib means, when applied to the smallest shank diameter size, can be made such as to insure engagement of the downwardly facing surfaces thereof with the supporting surfaces provided by the magazine assembly even when spaced apart to accommodate the largest shank diameter size. For example, it is contemplated that in the preferred embodiment transverse dimension of the rib means can be of the order of 0.109 inches. In general, this dimension exceeds the dimension between the periphery of the shank and the periphery of the head measured in the same direction. Stated differently, the dimension from the tip of one rib means to the tip of a rib means disposed on the opposite side of the row formation measured in a direction perpendicular to the extent thereof is generally somewhat greater than the diameter of the head. In the preferred embodiment set forth above this overall dimension between the tips of the rib means would be in a range from a dimension of the order of 0.332 inches to a dimension of the order of 0.362 inches compared with a head diameter dimension of the order of 0.305 inch.

While the above expressed relationship is preferred and desirable as applied throughout a fairly extensive size range, it will be understood that these relationships for any particular size may not be the most desirable and it is within the contemplation of the present invention for the overall rib dimension from tip to tip to be even somewhat less than the diameter size of the head.

The present invention also contemplates nail packages wherein the nail shanks are coated prior to the application of the strips thereto during assembly. In this regard, it will be noted that the amount of carrier strip material contacting the shanks is minimized, thus providing optimum integrity to the coating applied to the shanks.

It thus will be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing specific embodiment has been shown and described only for the purpose of illustrating the principles of this invention and is subject to extensive change without departure from such principles.

What I claim is:

1. In a nail package of the type comprising a plurality of nails each including a shank having a head at one end and a point at its other end, said nails being arranged in row formation with their shanks generally parallel and the heads of adjacent nails in lapped relation and means secured to opposite sides of the shanks retaining said nails in said row formation, the improvement which comprises said nail-securing means including a plurality of strips of material operable to be progressively disintegrated as the nails are progressively driven from the row formation, each of said strips being formed to provide relatively narrow thin elongated web means and longitudinally coextensive rib means, said web means extending longitudinally in the direction of extent of said row formation and transversely in the direction of extent of said shanks, the associated sides of said shanks being adhesively secured to said web means, said rib means extending longitudinally in the direction of extent of said row formation and transversely outwardly from the web means of the associated strip in a direction transverse to the direction of extent of said shanks.

2. The improvement as defined in claim 1 wherein said nail-securing means includes four strips of material, two on each side of the row formation, the rib means of each of said strips being spaced from said nail heads a different distance measured in the direction of extent of said nail shanks.

3. The improvement as defined in claim 2 wherein the web means of adjacent strips measured in the direction of extent of said nail shanks are disposed in spaced relation.

4. The improvement as defined in claim 1 wherein each of said strips is formed of a layer of heat-activatable adhesive on a backing portion.

5. The improvement as defined in claim 4 wherein said backing portion is made of an absorbent material.

6. The improvement as defined in claim 5 wherein said heat-activatable adhesive comprises a hot melt thermoplastic and said absorbent material comprises kraft paper.

7. The improvement as defined in claim 1 wherein the rib means of each strip comprises a longitudinal section of said strip folded along a longitudinally extending fold line.

8. The improvement as defined in claim 7 wherein said longitudinal section is folded along said fold line to an extant such as to define an included angle of the order of 20°.

9. The improvement as defined in claim 8 wherein said longitudinal section is disposed in the central portion of said strip and said fold line constitutes the medial line thereof.

10. In a nail package of the type comprising a plurality of nails each including a shank having a head at one end and a work-piercing point at its other end, said nails being arranged in row formation with their shanks generally parallel and the heads of adjacent nails in lapped relation, and means secured to opposite sides of the shanks retaining said nails in said row formation for manual handling as a unit for purposes of loading the same into a magazine of a nail-driving device and mechanical handling when loaded within the magazine as by spring pressure acting upon the trailing nail resiliently urging the leading nail into a drive track to be stripped from the row formation and driven by a longitudinal driving force applied to the head, the improvement which comprises said nail-securing means comprising a plurality of relatively narrow, thin elongated strips operable to be progressively disintegrated in response to the progressive stripping of the nails from the row formation, each of said strips including a normally nontacky material capable of being activated by a relatively high heat into a flowable adhesive on one side thereof and an absorbent material stable when said normally nontacky material is heat activated into a flowable adhesive and disposed in contact with said normally nontacky material so as to generally confine the same when heat activated, said strips being folded longitudinally to from web means and rib means, said web means extending longitudinally in the direction of extent of said row formation and transversely in the direction of extent of said shanks, the associated sides of said shanks being adhesively embedded in the normally nontacky material of said web means, said rib means extending longitudinally in the direction of extent of said row formation and transversely outwardly from the web means of the associated strip in a direction transverse to the direction of extent of said shanks, said rib means defining surfaces facing in a direction away from said heads extending continuously along opposite sides of the row formation in the direction of extent thereof by which the nail package can be supported for sliding movement within the magazine.

11. The improvement as defined in claim 10 wherein the rib means of each strip comprises a central longitudinal section folded along a central longitudinal fold line to define an included angle of the order of 20°.