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FASTENER STICK EMBODYING NAILS WITH ECCENTRIC FULL ROUND HEADS

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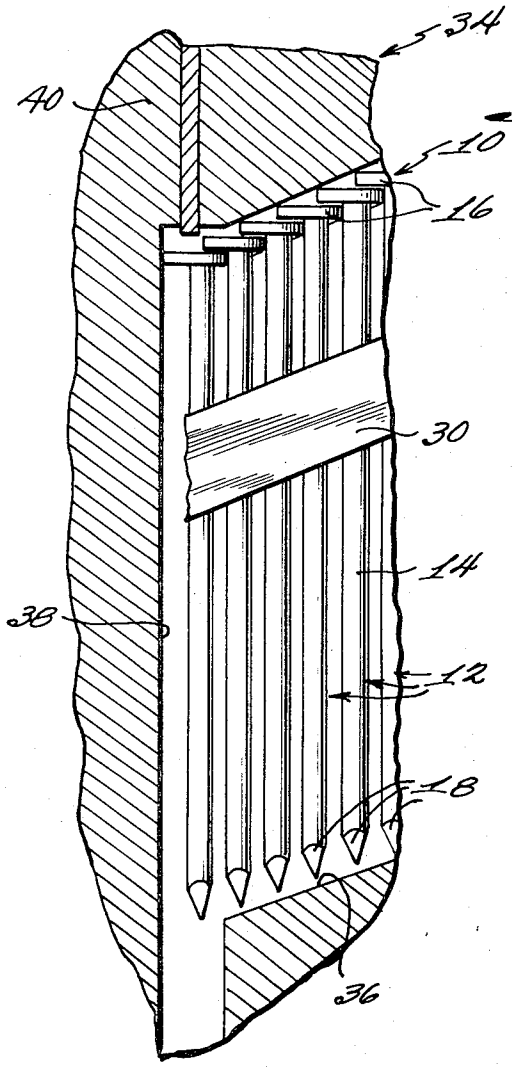


Fig. 1

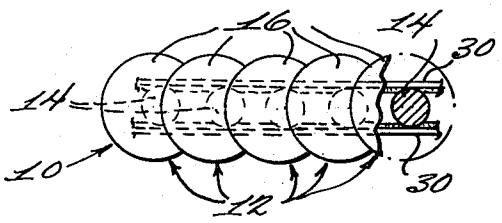
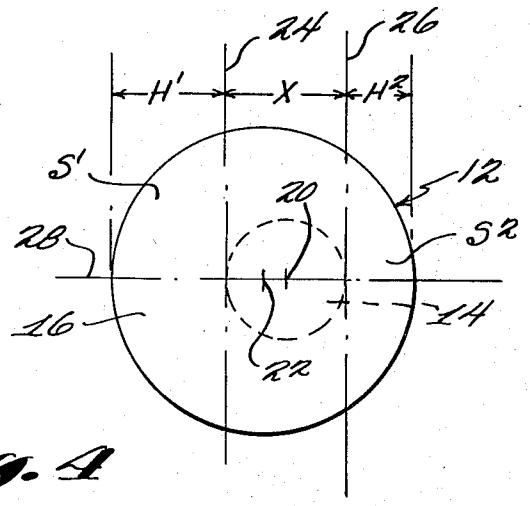


Fig. 2

Fig. 3



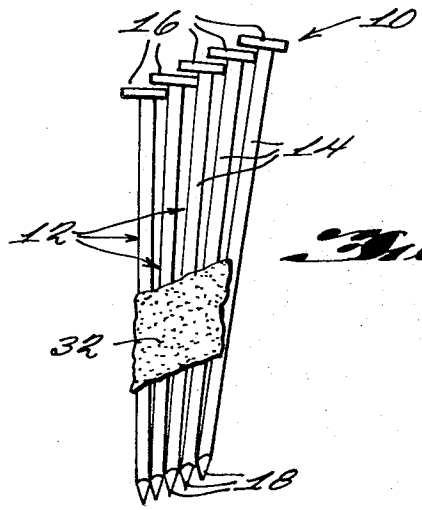


Fig. 4

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FASTENER STICK EMBODYING NAILS WITH ECCENTRIC FULL ROUND HEADS

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ABSTRACT OF THE DISCLOSURE

A fastener stick for use in a fastener driving device including a multiplicity of nails having full round heads fixed to shanks in eccentric relation so as to define large and small segments extending laterally outwardly in opposed relation from the shanks, the nails being secured together in row formation with the large head segments overlapping the small head segments and a portion of the shanks.

This invention relates to fastener packages and more particularly to stick-type full round head fastener packages for use in power operated fastener driving devices.

Stick-type fastener packages for use with fastener driving devices are well known. U-shaped staples are probably the most well known example of fastener packages of this type. U-shaped staples provide very little problem in the formation of the fastener stick and the feeding, stripping, and driving of the fasteners during the operation of the fastener driving device. Thus, the configuration of U-shaped staples is such that they can be easily butted together in row formation and held in such formation by the simple application of a suitable adhesive. The adhesive serves to retain the individual staples in a generally rigid stick formation so that they can be easily handled prior to and during loading, while at the same time permitting individual staples to be easily stripped from the remaining stables during the driving stroke of the driving element of the fastener driving device. In general, however, the utilization of U-shaped staples has been limited as to maximum size in the range of 2 inches to 2½ inches. To date, there has been no widespread acceptance or use of U-shaped staples of a size equivalent to 10-penny nails and higher.

Another fastener stick which has been utilized with fastener driving devices is made up of T-head nails. T-head nail sticks are particularly prevalent at the heavier sizes, such as 2 inches to 2½ inches. A T-head nail differs from a U-shaped staple in that it has a single shank rather than spaced parallel shanks and the head portion includes two diametrically opposed laterally extending portions rather than a single portion extending laterally between the two parallel shanks. T-head nails provide the same ease and facility of packaging and feeding in the fastener driving device as U-shaped staple sticks. However, T-head nails, as well as U-shaped staples, are not satisfactorily in many applications where full round head nails have been used heretofore. For example, in the building trade, there are often code regulations which require utilization of full round head nails so that T-head nails are excluded by code from use. The present invention has applicability throughout a full range of fastener sizes including nails of a size of 10-penny and above, where staples and T-head nails have heretofore not been utilized, as well as of a size of 8-penny and below, within which range staples and T-head nails are available.

While a full round head fastener is highly desirable and sometimes essential, full round heads on the shanks of the nails prevent assembly in simple stick formation and hence the securement of all of the advantages which

are achieved by staples and T-head nail sticks. Generally, there have been proposed three types of full round head nail sticks. First, it has been proposed to form a full round head nail stick by mounting the nails in row formation with their shanks in parallel longitudinally coextensive relation and with their heads in substantial abutting or slightly spaced relation. Various carrier strip arrangements have been proposed to secure the nails in this row formation, such as carrier strips extending along one or both sides of the row of nail shanks, as well as carrier strips for securing the heads only together. An advantage of an arrangement of this type is that the feeding of the stick in a fastener driving device is relatively simple (although means must be provided for handling the carrier strip) and the stripping of individual fasteners from the stick is greatly simplified since there is no interference between individual fasteners. However, an arrangement of this type provides a very unfavorable density of fasteners per unit stick length requiring frequent reloading.

Second, it has been proposed to form a full round head nail stick by mounting the nails in row formation with the shanks disposed in parallel relation and with the trailing portion of the head of each overlapped by the leading portion of the head of the adjacent nail. This arrangement improves the density of the stick as compared with the first arrangement.

Third, it has been proposed to form a full round head nail stick by mounting the nails with their heads in overlapping relation as in the second proposal but instead of maintaining the shanks in parallel relation, the points of the fasteners are disposed in abutting relation so as to provide a fanned row formation. This arrangement improves somewhat the densification problem but increases the individual fastener stripping problem.

To a large extent, while the problems relating to the feeding, stripping and driving of full round head nail sticks can be suitably resolved by appropriate design of the fastener driving device, the problem of package density cannot be so resolved.

An object of the present invention is the provision of a fastener package embodying full round head nails which are mounted together so as to provide for increased nail density in the package while still maintaining desirable characteristics with respect to ease of feeding, stripping and driving in a fastener driving device.

Another object of the present invention is the provision of a stick type fastener package embodying full round head nails, which nails may be produced in conventional fashion, readily assembled in stick formation, and secured in assembled stick formation by conventional means such as adhesives and carrier strips, the resulting secured assembled nail stick being capable of easy handling prior to and during loading in a fastener driving device and of simple feeding, stripping and driving in the operation of the fastener driving device.

Still another object of the present invention is the provision of a fastener stick of the type described which is simple in construction, economical to manufacture and efficient in operation.

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 in which an illustrative embodiment is shown.

In the drawings:

FIGURE 1 is an elevational view of a fastener stick embodying the principles of the present invention illustrating the manner in which the fastener stick is fed, stripped and driven in a fastener driving device;

FIGURE 2 is a top plan view of the fastener stick shown in FIGURE 1;

FIGURE 3 is an enlarged top plan view of a single nail of the fastener stick illustrating the relationship between the shank and head of the nail; and

FIGURE 4 is an elevational view of a modified form of fastener stick embodying the principles of the present invention.

Referring now more particularly to FIGURES 1–3, there is shown therein a fastener stick, generally indicated at **10**, embodying the principles of the present invention. As shown, the fastener stick **10** is made up of a multiplicity of individual nails, generally indicated at **12**, which, within usual manufacturing tolerances, are of the same size and configuration. Each nail **12** includes an elongated shank **14** having a full round head **16** formed on one end thereof and a work piercing portion in the configuration of a point **18** formed on the opposite end thereof.

In the embodiment shown, the shank **14** is of cylindrical configuration such as is provided by a conventional common nail. However, it will be understood that it is within the contemplation of the present invention to utilize nails in which the shanks are fluted, serrated or provided with other configurations enhancing their holding ability. Likewise, the work piercing portion **18** of the shank may assume configurations other than a pointed configuration. For purposes of the present invention, the shank, irrespective of its peripheral configuration, may be considered to have a longitudinal axis which is indicated at **20** in FIGURE 3.

The head **16** is of circular configuration in plan, similar in shape to a full round head such as provided by conventional common nails. It will be understood that the terms herein utilized to describe the configuration of the nail **12** must be given a practical connotation bearing in mind the usual manufacturing tolerances encountered in the conventional nail manufacturing art. Thus, the term "full round" or "circular" in describing the head is not limited to a perfect circle but contemplates within its meaning a head which is manufactured within conventional tolerances to be substantially circular or round. Essentially, the head includes a central axis such as indicated at **22** in FIGURE 3.

In accordance with the principles of the present invention, each nail **12** of the fastener stick **10** is formed with the axis **20** of the shank **14** in laterally spaced relation to the axis **22** of the head **16**. Since it is essential in accordance with the principles of the present invention to retain the favorable holding characteristics of a full round head, the range of spacing between the axes **20** and **22** is dependent upon the relative diameter sizes of the shank and head. Consequently, the range of eccentricity within the principles of the present invention can best be expressed in relation to these diameters rather than the axes **20** and **22**.

The essential relationship between the shank and head of the nails **12** of the present invention can best be expressed with reference to a pair of planes **24** and **26** which are parallel to each other and perpendicular to a plane **28** within which the axes **20** and **22** are contained, the planes **24** and **26** being tangent to the periphery of the shank. The distance between the planes **24** and **26** indicated by the reference character X in FIGURE 3 is a function of the shank diameter. It can be seen that the intersections of the planes **24** and **26** with the head **16** of the nail define a large segment S^1 and a small segment S^2. The height, indicated at H^1 in FIGURE 3, of the segment S^1 plus the height, indicated at H^2 in FIGURE 3, of the segment S^2 plus the distance X is another expression of the head diameter. Thus, in order to achieve the advantages of a full round head nail, the relationship of the head diameter of H^1 plus X plus H^2 to the shank diameter or X is in a ratio greater than 2.1 but less than 3. The eccentricity is in a range in which H^1 exceeds H^2 by at least $X/10$ but no more than X, a preferred range being one in which H^1 exceeds H^2 by at least $2X/5$, but no more than $3X/5$, and the preferred embodiment, as shown in the drawings, is one in which H^1 equals $X/2$.

The fastener stick **10** of the present invention is made up of a multiplicity of nails **12** of the same size and configuration constructed in accordance with the description set forth above, the nails being assembled in row formation so as to provide a pair of spaced end nails and a multiplicity of intermediate nails therebetween with all of the nails of the row disposed with the axes **20** and **22** of their shanks **14** and heads **16**, respectively, aligned substantially in a single common plane and with the small segment S^2 of each intermediate nail disposed in substantially abutting relation to the periphery of the shank **14** of one nail **12** adjacent thereto and the large segment S^1 of each intermediate nail disposed in overlying adjacent relation to the small segment S^2 and a portion of the shank of the other nail adjacent thereto as is clearly shown in FIGURES 1 and 2. In the embodiment of FIGURES 1 and 2, the axes **20** of the shanks **14** are disposed in parallel relation.

Any suitable means may be provided for securing the multiplicity of nails in the assembled relation described above with sufficient rigidity to permit the assembly to be easily handled and loaded into the magazine of the fastener driving device, while at the same time permitting ready feeding, stripping and driving of the individual nails during the operation of the fastener feeding device. In the embodiment shown in FIGURE 1, the securing means is in the form of a pair of opposed carrier strips **30** of fibrous material, such as paper or the like, bonded to opposite sides of the row of nail shanks intermediate the ends thereof by a suitable adhesive material. The adhesive material may be any of the well-known adhesives that have been conventionally used for this purpose heretofore as, for example, solvent or heat activated resins such as polyvinyl chloride resin, hot melt resin and the like. The carrier strips **30** are secured to the shanks by the adhesive material so that the latter extends within the space between adjacent shanks or the adhesive may simply contact the periphery of the shanks at one side (where only one carrier strip is used) or both sides of the row formation thus leaving the space between adjacent shanks free of adhesive material. The securing means may be applied to the assembled nails in any conventional fashion. Various coatings may be applied to the shanks primarily for the purpose of increasing the holding capacity of the nails once driven, as is well known in the art.

Referring now more particularly to FIGURE 4, it is within the contemplation of the present invention to assemble the nails in the relationship described above but with the axes **20** of the shanks of the nails disposed in non-parallel relation wherein the end portion of the shanks adjacent the points **18** are disposed in abutting or substantial abutting relation. Under these circumstances, it is preferable to utilize an adhesive material **32** without a carrier strip, the adhesive material serving to secure the assembly of nails in rigid row formation at a position adjacent the points thus minimizing the amount of adhesive necessary to fill the spaces between adjacent shanks. It will be understood, however, that it is within the contemplation of the present invention to apply the adhesive material and/or carrier strips to any suitable position or positions along the shanks or adjacent the heads of the assembled nails.

In FIGURE 1, a portion of a conventional power driven fastener driving device is illustrated and generally indicated at **34**. The device includes the usual magazine structure, generally indicated at **36**, of a type similar to the conventional type utilized with T-head nails modified to extend at an upward and rearward inclination rather than having a conventional horizontal extent. The manner of feeding the fastener stick **10** of the present invention within the fastener driving device **34** would be by simple spring pressure in accordance with conventional practice utilized

to feed T-head nails. Thus, a spring pressed follower acting on the trailing end nail (not shown) serves to bias the leading nail of the fastener stick into a drive track **38** of the fastener feeding device **34** so that the axes **20** and **22** of the leading nail are parallel with the axis of the drive track.

The range of eccentricity of the heads with respect to the shanks of the nails of the fastener stick provides a desirable optimum density and simplicity in the stripping and driving operation of the fastener driving device **34**, while maintaining all of the desirable holding characteristics of a full round head nail after the nail is driven. Thus, within the preferred range, a minimum increase in nail density of 44% per hundred nails and a maximum increase in nail density of 67% per hundred nails is achieved in comparison with a full round head nail stick disposed with the heads in lapped relation, such as heretofore proposed. Moreover, this increased density is achieved with respect to a parallel shank fastener stick, such as shown in FIGURES 1–3, as well as an abutting shank fastener stick, as shown in FIGURE 4. The increased density is achieved while at the same time the leading nail is presented to the drive track in a position to be stripped from the stick and driven by a single drive stroke of a driving element **40** which acts on a portion of the head at least a part of which directly overlies the shank.

As shown in FIGURE 1, the driving element **40** is of rectangular cross-sectional configuration, although it will be understood that other configurations, which permit clearance of the driving element with the head of the nail adjacent the leading nail during the driving stroke, may be employed, if desired. With the preferred eccentricity as shown in FIGURE 1, the lower surface of the driving element **40** is configured so as to contact the portion of the upper surface of the head of the leading nail which overlies a portion of the shank. This insures that the leading nail will be initially stripped from the package and subsequently driven by a force acting directly through the shank of the nail. This preferred relationship may not be obtained in the maximum eccentricity within the operative range of the present invention and under these circumstances it may be desirable to provide means in the fastener driving device for camming the leading nail forward during the driving stroke between the time that it is stripped from the package and the time it initially engages the work. The preferred range of eccentricity would not require such an operation in the fastener driving device.

It thus will be seen that the objects of this invention have been fully and effectively accomplised. 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. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

It is claimed:

1. A fastener stick comprising a multiplicity of nails generally of the same size and configuration, each of said nails including an elongated shank having a central longitudinal axis and longitudinally spaced ends, a work piercing portion formed on one end of the shank, and an enlarged circular head having a central axis fixedly secured to the other end of the shank with its central axis disposed in parallel laterally spaced relation to the axis of the shank so that said parallel axes are disposed in a common plane and a pair of planes normal to the common plane and tangent to the periphery of the shank adjacent the head intersect the circular head along chord lines spaced apart a distance X and define a large segment having a height H^1 and a small segment having a height H^2 in which the ratio of H^1 plus X plus H^2 to X is greater than 2.1 but less than 3 and H^1 exceeds H^2 by at least $X/10$ but no more than X, and means securing said nails a generally rigid row having spaced end nails and intermediate nails therebetween with all of the nails of the row disposed with the axes of their heads and shanks aligned substantially in a single common plane and with the small segment of each intermediate nail disposed in substantial abutting relation to the periphery of the shank of one nail adjacent thereto and the large segment of each intermediate nail disposed in overlying adjacent relation to the small segment and a portion of the shank of the other nail adjacent thereto.

2. A fastener stick as defined in claim **1** wherein H^1 exceeds H^2 by at least $2X/5$ but not more than $3X/5$.

3. A fastener stick as defined in claim **1** wherein H^1 exceeds H^2 by substantially $X/2$.

4. A fastener stick as defined in claim **1** wherein the axes of the shanks of the row of nails are parallel.

5. A fastener stick as defined in claim **1** wherein the axes of the shanks of the row of nails are disposed in angular relation with respect to each other, the shanks of said nails adjacent the work piercing portions thereof being disposed in substantially abutting relation.

6. A fastener stick as defined in claim **1** wherein said securing means includes an adhesive applied to the shanks of the nails.

7. A fastener stick as defined in claim **6** wherein said securing means further includes a carrier strip of material secured to said shanks by said adhesive.

No references cited.

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