July 4, 1944. T. P. CAMP 2,353,110

PLASTER BOARD NAIL

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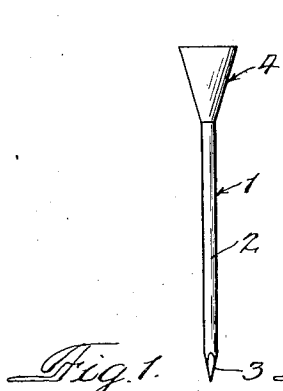



Fig. 1.

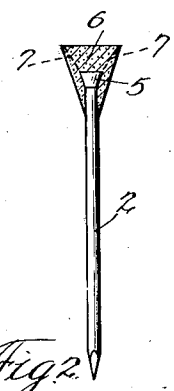



Fig. 2.

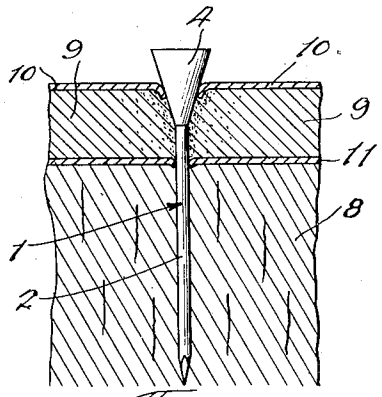



Fig. 3.

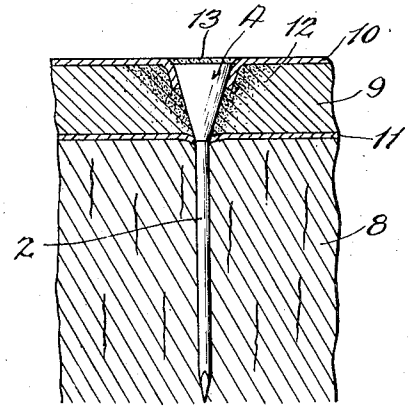



Fig. 4.

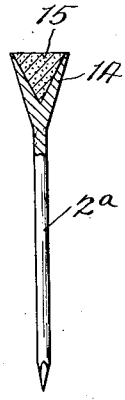



Fig. 5.

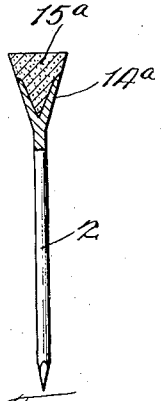



Fig. 6.

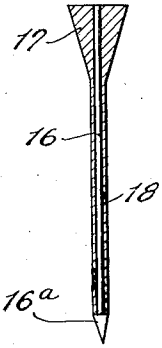



Fig. 7.

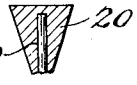



Fig. 8.

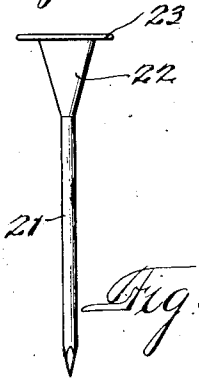



Fig. 9.

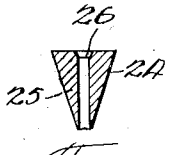



Fig. 10.

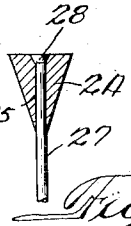



Fig. 11.

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# UNITED STATES PATENT OFFICE

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## PLASTERBOARD NAIL

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Application July 13, 1940, Serial No. 345,423

4 Claims. (Cl. 85—28)

This invention relates to fasteners, and more particularly to a nail adapted to secure plaster board, plaster wallboard, fiber insulating board, acoustic tile, and other sheet or tile-like materials which are softer and more compressible than wood or the like supports to which they are to be secured.

Building structures are ordinarily provided with studding, furring strips, or the like, which may be of wood or other material and which supports provide high nail-holding power whereby wallboards, tile, or the like may readily be secured thereto by means of ordinary nails. However, plaster boards and similar panels or tiles for which the present invention is particularly adapted are of softer and more compressible material than the supports and, in themselves, provide very little nail-holding power. Therefore, the nails now used for securing this type of board to the support are of two general classes. The first is the common flat-headed nail having a comparatively large-diameter head; the second is the so-called finishing nail or casing nail having a head only slightly larger than the shank and more particularly designed for use with wood panels or panels of considerable density whereby high nail-holding power is provided in the panel itself.

The common flat-headed nail has been preferred for the soft materials because of the high holding power of its relatively large-diameter head as compared to the finishing or casing nail. However, since it is necessary to sink the head of this nail at least flush with the surface of the fabric covering on gypsum board products and the like, the fabric covering of the board is often cut through around the head and the core is more or less crushed, thereby greatly weakening the holding power of the nail. Also, since it is possible to drive the head of the common nail flush with the surface of the comparatively soft board before the board is seated against the support, particularly if the support is slightly out of line with other adjacent supports, the use of the common nail results in so-called "nail pops" which occur when the support and the panels move relative to each other due to load or humidity changes. This movement forces the head of the nail out of its seat in the board, or rather forces the board inwardly, thereby damaging any decorative surface which may have been applied and in any case providing a very unsightly appearance.

Furthermore, under certain temperature and humidity conditions, moisture will condense on the head of the nail, causing rusting or other discoloration of the board surface or discoloration of any paint or other decorative coating applied over the nail head. Common nails also are objectionable for use in connection with uncoated walls formed of plaster boards, acoustical tile, and the like, because the nails must be coated or decorated in some way to conceal their presence if a good appearance is desired in the finished wall.

So-called finishing nails or casing nails, although occasionally used for erecting materials of the class described, are not satisfactory for general use because of their low holding power in the soft material of the plaster board. The finishing nail usually has sufficient holding power in the support itself, but the softer boards of the type previously mentioned tend to creep outwardly over the small head of the nail. In other words, the shank of the nail provides only very slight holding power, if any, in the soft material, and the small head is insufficient to increase the holding power to any great extent.

It is, therefore, an object of this invention to provide means for securing relatively soft or crushable sheet-like panels or tile materials to a support and which will maintain a high degree of holding power in the soft panel itself under severe conditions of use. Also the nail of the present invention, because of the greater force required to force the conoidal head into the soft board, will firmly seat the board against the support even if it is normally held spaced therefrom by adjacent supports.

Another object of the invention is to provide a nail which will insure the snug seating of the board or tile against its support as the nail is driven home and without crushing or materially compressing the material of the board transversely thereof.

It is also an object to provide a fastener of the character described which causes a progressively increased density of the material from the inner to the outer side of the panel around the nail as the nail is driven home, and this is accomplished by lateral pressure substantially in the plane of the board and without materially compressing the board transversely thereof.

Another object is to provide a fastening nail of the character described in which the exposed surface of the head and a considerable portion adjacent thereto is a very poor conductor of heat. That is, it has a lower specific heat and lower conductivity than the shank of the nail, whereby moisture condensation on the nail head is prevented and discoloration of a wall covering over the nail head is substantially eliminated.

A further object is the provision of a fastener having a head of heat insulating plastic material which may, if desired, be of a color harmonizing with the panels with which it is to be used, whereby the necessity for covering the fastening heads is obviated and the heads will be substantially unnoticeable, particularly if the

panel is provided with a figured surface pattern.

A further object is the provision of a nail having an elongated conoidal head of heat-resisting material such as molded cellulose acetate plastic or other suitable plastic and in which the end of the shank is completely embedded in the conoidal head and is of such shape and so related thereto as to provide a maximum of crushing strength of the head under the usual hammer blows when driving the nail.

Another object is to provide a preformed auxiliary nail head of plastic material which may easily be assembled with a suitable nail having a relatively very small driving head and whereby after assembly the hammer blows may be concentrated on the driving head, and the auxiliary head will provide exceptional holding power in plaster board and the like.

Further objects will be apparent from the specification and the appended claims.

In the drawing:

Fig. 1 is a side elevation of one embodiment of the nail or fastener of this invention.

Fig. 2 is a view similar to that illustrated in Fig. 1 with the molded plastic portion of the head shown in axial section.

Fig. 3 is a sectional view through a building joint assembly comprising a panel of soft material being secured to a support such as a studding with the fastener of this invention partly driven in place.

Fig. 4 is a view similar to that of Fig. 3 with the fastener completely driven home to complete the assembly.

Fig. 5 is a side elevation of another embodiment of the invention with the head of the nail shown in axial section.

Fig. 6 is a view similar to Fig. 5, but illustrates a slightly different relationship of the metal and insulating portions of the device.

Fig. 7 illustrates a slightly different embodiment of the invention in which substantially the entire length of the shank is covered with molded insulation and the shank is exposed at the head of the nail for driving purposes.

Fig. 8 is a fragmentary detail view showing the plastic material extending over the end of a straight shank.

Fig. 9 illustrates an embodiment in which the base of the conoidal head is provided with an annular flange.

Fig. 10 is an axial sectional view of a preformed auxiliary plastic nail head adapted to be assembled on a suitable finishing or casing nail.

Fig. 11 is a similar sectional view of the head after assembly on a shank.

Referring to the drawing in detail, the embodiment illustrated in Figs. 1 to 4, inclusive, comprises a nail-like fastener 1 having an elongated, wire-like, small-diameter shank 2 pointed on one end as at 3 and provided with an inverted conoidal head 4. It will be understood, of course, that the entire fastener, including the shank and conoidal head, may be of metal if desired, and configuration of the head and its relationship when in use in connection with the usual panel for which it is adapted will provide exceptionally advantageous features.

The invention contemplates the use of plastic material of lower heat conductivity and lower specific heat than the metal of the nail shank on which it is molded to thereby prevent discoloration by condensation of moisture and also for the purpose of presenting a more attractive appearance in the completely assembled wall. The fastener is, therefore, constructed substantially as illustrated in Fig. 2, wherein the shank 2 is provided with a comparatively small, preferably conoidal, head 5 integral therewith and completely embedded in the plastic material 6 of the head 4. The material 6 is preferably molded cellulose acetate plastic or other plastic of such general type which provides the necessary strength and hardness to resist hammer blows without crushing, and which will have the other desirable characteristics previously mentioned.

It has been found in practice that, for best results, the conoidal head 4 should have a striking face of large diameter relative to the diameter of the shank, and the conoidal portion is preferably approximately as long as, or slightly less in length than, the thickness of the panel with which it is to be used. In any case, it should be of sufficient length to provide the required lateral compression of the soft material of the panel. A nail approximately 1½ inches long with a $\frac{1}{16}$ inch or less diameter shank and the conoidal head approximately ⅜ inch long with a ¼ inch face is satisfactory for use in connection with the usual standard panels of the character previously described.

The heads 4 are so related to the upset end 5 of the shank that sufficient plastic material is provided over the end of the upset portion to provide strength and prevent moisture condensation, and the material is so related and proportioned relative to the shank end that the force of a hammer blow on the face of the insulation is substantially uniformly distributed over the flat end of the upset portion 5.

It has been found that, in a cylinder of insulating material of the diameter of the base of the conoidal plastic head, the angular cleavage lines when a crushing force is applied will be substantially as indicated by the dotted lines 7 in Fig. 2. Therefore, the conical upset portion 5 on the shank is of sufficient diameter to approximately intersect the cleavage lines in such a manner that substantially all of the hammer blow is concentrated on the enlarged end of the shank as shown. The plastic material is preferably from $\frac{1}{16}$ inch to ⅛ inch thick over the enlarged end of the shank and the striking face is preferably about ¼ inch in diameter. The included angle of the conoidal head is preferably approximately 30 degrees, so that it is substantially the length of the thickness of the standard panel and the material at the sides of the embedded shank reinforces the cleavage lines without presenting any appreciable amount of material at the face of the head to receive the striking blow of the hammer. By this construction, a plastic insulating head having the desired characteristics may be molded to the shank in quantity production and will provide all necessary strength and other required characteristics.

Fig. 3 illustrates a well joint assembly using one of the fasteners of this invention, and comprises a studding, furring strip, or other suitable support 8 which may be of wood or other nailable material having high nail-holding power. A plaster board or the like 9 is placed against this support, and one of the nails 1 is shown partly driven therethrough and into the support 8. The ordinary gypsum board is provided with fabric coverings 10 and 11, and it will be noted that after the small-diameter shank 2 perforates the

plaster board, the fabric covering is pressed downwardly and laterally and the long conical head 4 also laterally compresses the soft material of the panel 9 and causes it to become increasingly dense in the vicinity of the nail from the inner side of the board outwardly, and this is accomplished without materially compressing the board transversely thereof.

Fig. 4 illustrates the fastener completely driven in place, and the material adjacent the head, as indicated by the stippling at 12, has been laterally compressed so as to greatly increase the frictional resistance against the fastener head 4. Therefore, the reverse holding power of the panel on the nail head may be substantially as great as the holding power of the support 8 on the shank. There is, therefore, no tendency for the panel to creep from the head 4. It will also be noticed that the fabric 10 is not torn or ruptured around the edge of the face of the fastener, but is very smoothly and sharply rounded so that the joint between the fabric and the nail head is quite inconspicuous.

In driving these fasteners, due to the fact that the board 9 is of comparatively soft material, the face of the fastener may be and is preferably driven slightly below the face of the panel. This provides a slight depression over the face of the fastener which may be filled with plaster or the like 13 which may be of a color to harmonize with the panel surface. If desired, however, this plaster covering may be omitted and the plastic heads may be made of any desired color to harmonize with the panel board surface.

Figs. 5 and 6 illustrate a slightly different embodiment in which the shank 2a is provided with a hollow, thin-walled, conoidal portion 14 in which, as shown in Fig. 5, these thin walls may extend completely to the face of the head of the nail. The socket provided by the walls 14 may be filled with plastic insulating material 15 similar to that previously described, which may be molded therein or which may be molded separately and secured therein by means of a suitable adhesive. In Fig. 6 the thin walls 14a of the conoidal portion terminate short of the driving face of the fastener. In other respects this embodiment is the same as that shown in Fig. 5.

Fig. 7 illustrates an embodiment in which a small-diameter metal shank 16 extends completely through the conoidal plastic head 17 so that the striking force is concentrated on the end of the shank. If desired, in this construction the shank 16 may be provided with a shouldered point 16a, and a thin layer of the insulating material may completely enclose the shank as shown at 18.

Fig. 8 illustrates an embodiment somewhat similar to that shown in Fig. 7. However, in this embodiment a small-diameter shank 19 is provided which terminates somewhat short of the face of a conoidal plastic head 20 so that no metal whatever is exposed in the face of the fastener and condensation will be eliminated. However, even if the shank does extend completely to the striking face, as shown in Fig. 7, the extremely small diameter will cause only a slight discoloration, if any, and this discoloration is not easily apparent on the finished surface, particularly if that surface is provided with a figured design.

Fig. 9 illustrates a slightly different embodiment in which a small-diameter shank 21 is provided with a conoidal head 22 which may be of similar proportions to the heads previously described and is integral with the shank 2 and provided with an annular flange 23. This flange provides an enlarged face which will cover the joint between the fabric of the plaster board and the fastener head, and also provides an additional barrier to prevent creeping of the panel board from the nail.

Figs. 10 and 11 illustrate another embodiment, in which an auxiliary head 24 is separately molded or formed of plastic material of the same type, and preferably of the same dimensions, as those previously described. An axial hole 25 is formed through the auxiliary head 24 and terminates at its upper end in a seat 26 to receive a nail head. A suitable nail 27 may be inserted in the hole 25 with the head 28 in the conical seat 26, and the hammer blows will be concentrated on the head 27. The seat 26 is preferably conical, as shown, but may be of any required shape properly to seat a complementary nail head therein.

The present invention provides a nail particularly useful for securing plaster board having the usual fibrous cover such as paper or the like to a support, whereby, when the nail is driven in until the head is flush, or is completely embedded in the plaster board, the fibrous cover around the nail head will be turned inwardly a material distance and laterally compressed without shearing the fibrous cover. Simultaneously the plaster is laterally compressed and made more dense underneath and around this turned-in fabric. The fabric, therefore, acts as a reinforcing washer for the compressed plaster and the holding power on the nail head is greatly increased.

It is intended, of course, that the invention should not be limited to the specific embodiment or embodiments disclosed herein, since modifications may be made, and it is contemplated, therefore, by the appended claims to cover any such modifications as fall within the true spirit and scope of this invention.

Having thus described this invention, what is claimed and desired to be secured by Letters Patent is:

1. A nail for fastening relatively compressible board-like panels which comprises a pointed metallic shank of substantially uniform cross-sectional area and about 1½" in length, and a conical head, of molded hammer-blow-resistant cellulose ester plastic, said head being in the form of an inverted cone having an inclined angle of about 30°, about ¼" in diameter at its base, and about ⅜" in height, said shank extending into said head about one half the height of the cone.

2. A nail comprising a metallic shank of substantially uniform cross sectional area having a point at one end and a conical upset portion at the other end, said upset portion being imbedded in a conoidal mass of molded hammer-blow-resistant low-heat-conductance hard plastic material, substantially larger than said upset portion, and of such size that when a crushing force is applied to the base of said mass, the angular cleavage lines thus generated will be intersected by the conical upset portion in such manner that substantially all of said force is concentrated upon said upset portion, thereby rendering the nail drivable by hammer blows upon said conoidal mass without breakage of said mass.

3. The nail substantially as claimed in claim 2, in which the mass is a cellulose ester.

4. The nail substantially as claimed in claim 2, in which the mass comprises cellulose acetate.

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