

[54] **HOLLOW SHEET METAL NAIL**
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[52] **U.S. Cl.**.....85/11, 85/31
[51] **Int. Cl.**.....E01b 9/12, F16b 15/04
[58] **Field of Search**.....85/11, 10, 23, 30, 14, 49, 85/13, 26, 31; 52/362, 363, 361; 287/20.92 E

[56] **References Cited**

UNITED STATES PATENTS

667,814	2/1901	Wyland	85/11
2,745,308	5/1956	Gisondi	85/11 X
3,466,967	9/1969	Hallock	85/11

FOREIGN PATENTS OR APPLICATIONS

920,221	11/1954	Germany	85/11
957,852	5/1964	Great Britain	85/11

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Attorney—A. Yates Dowell and A. Yates Dowell, Jr.

[57] **ABSTRACT**

A sheet metal nail has a head and two channel shaped legs connected at one end to the head portion and terminating in penetrating ends. The legs have longitudinally straight parallel outer sides and a curved intermediate side portion with the straight sides of one received substantially their full width within the straight sides of the other, and with the opposed curved sides being separated at their head end and at their penetrating end substantially the same distance apart and in which the curved intermediate side of each leg is curved inwardly. When this nail is driven into a poured aggregate, no void is left near the penetrated surface of the aggregate which there would be if the legs were closer together at the head end than at their penetrating end, thereby eliminating an initial yield as well as offering greater resistance to the withdrawal of the nail.

6 Claims, 14 Drawing Figures

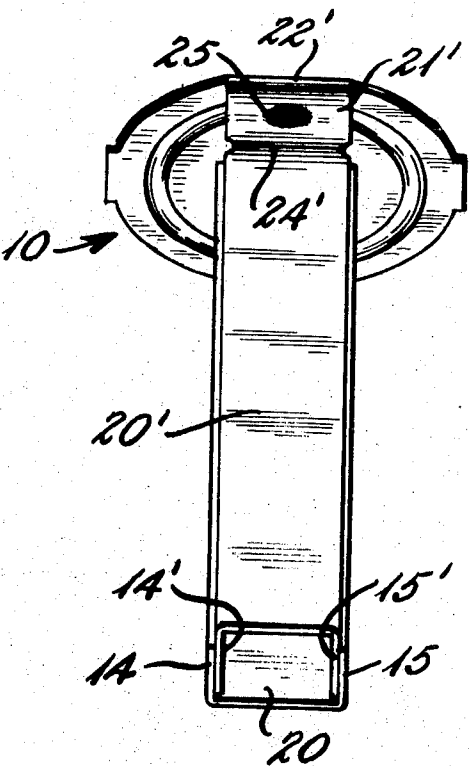


FIG. 9

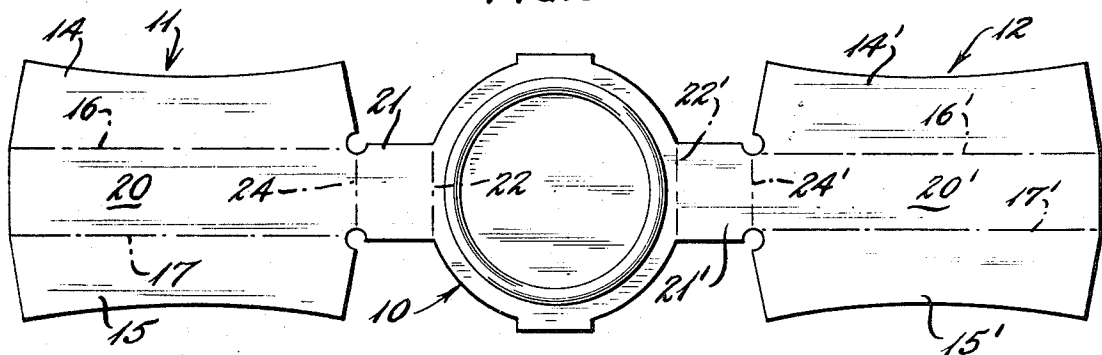


FIG. 10

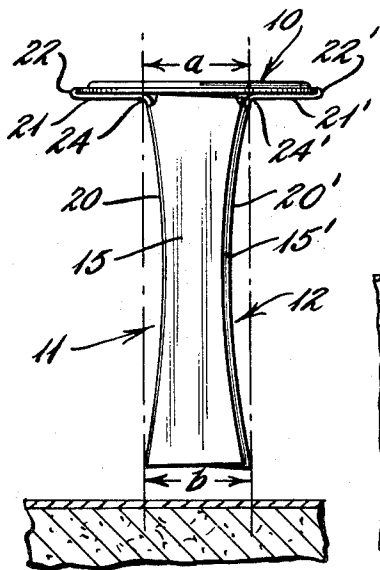


FIG. 11

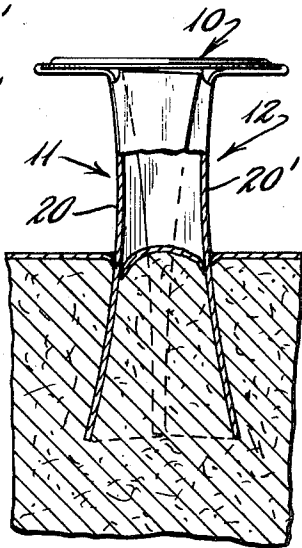


FIG. 12

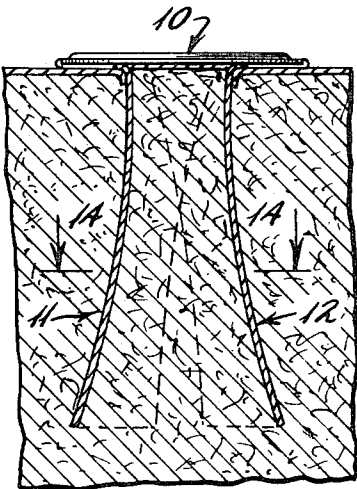


FIG. 13

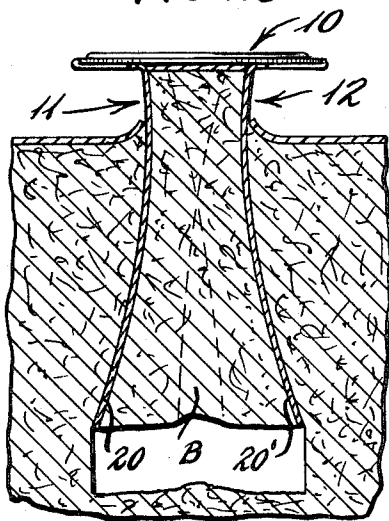
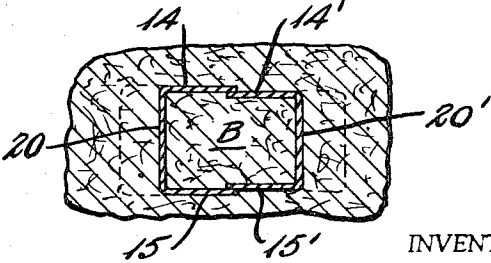


FIG. 14



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HOLLOW SHEET METAL NAIL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is in the special type of nail art in which the nail is employed for fastening relatively soft material, such as roofing felt and the like, to a somewhat firmer base such as poured vermiculite and perlite type roof deck material.

The nail is particularly adapted for use in lightweight insulating concrete of the type that is used for roofs and which employs as the aggregate materials such as vermiculite and perlite. In ordinary use these aggregates are added to Portland cement and water and an air entraining agent. Depending upon moisture conditions, the mixture may require approximately 4 weeks to attain the necessary strength for holding roofing that is attached by various prior art nails. Another roofing material is gypsum concrete, which begins to set up after a much shorter time, generally on the order of 1 to 2 hours. Due to the relative softness of such roofing, its nail holding ability has oftentimes been inadequate for prior art nails even after the material has thoroughly set. The roof has been especially susceptible to injury prior to setting due to the low holding ability of the nails therein. During this time, for example, if there has been a high wind the roofing felt and other material may blow off or become loose, partially withdrawing and raising the heads of the nails above the deck surface where the shanks rust in place and eventually cause puncturing of the roofing overlying the heads.

2. Description of the Prior Art

Various kinds of nails have been produced of many types of materials, including sheet metal, and with expandable and deformable portions intended to provide solid connections in specific materials. These nails have not been satisfactory for securing roofing, roofing felt, insulation, and the like, to relatively soft or plastic material such as recently poured roof decks of vermiculite, perlite and the like, mainly because their expandable parts or portions contracted easily and offered little more resistance to withdrawal than to drive and consequently have inadequate holding power. Cut and bright nails have also been used but their holding power is dependent on their rusting in place in the poured decks during drying.

My U.S. Pat. No. 3,466,967 describes an improved nail with substantially greater holding power than other prior art nails. However, such nail could be moved slightly from side to side due to the void left in the material into which it was driven (see FIG. 8 of my patent), due to the head end of the shank being smaller than the penetrating end which left a void in the material under the head and permitted the nail to be withdrawn a slight amount (designated as yield) before the nail reached its maximum resistance to withdrawal.

Other nails in the prior art have included legs or portions which spread and deform as they are driven into material for the purpose of resisting withdrawal. For example, Gisondi, U.S. Pat. No. 2,745,308, patented May 15, 1956, has a pair of straight V shaped legs with a tapered point and having barbs along their sides. If used in poured gypsum, vermiculite or perlite material, however, this nail can be withdrawn with substantially less force than a nail in accordance with the present invention since the legs do not hold a plug of the material

into which it is driven, but merely withdraw substantially along the path which they follow when driven, the softness or plasticity of the base permitting relatively easy withdrawal. Other patents along the same general line are Snyder, U.S. Pat. No. 3,003,386, of Oct. 10, 1961 and Vatet, U.S. Pat. No. 2,283,243. These nails appear to be intended for use in fiber board and precast gypsum board but not in poured gypsum, vermiculite or perlite.

Other prior art nails having legs which diverge as they are driven into wood or denser material are Trimbach et al., U.S. Pat. No. 1,871,481, of Aug. 16, 1932, Openshaw, U.S. Pat. No. 2,321,101, of June 8, 1943, and Italian Pat. No. 509,032, of 1957.

A common element in all of the prior art patents mentioned, except Hallock, U.S. Pat. No. 3,466,967, is that the legs distort or bend in their length as the nail is driven. In Hallock, U.S. Pat. No. 3,466,967, the cone shaped shank portion 11 spreads but the sides do not bend lengthwise.

SUMMARY OF THE INVENTION

The present invention is a sheet metal nail of the type described in which the two channel shaped legs have inwardly curved opposing sides so that when the nail is driven the penetrating ends spread apart into outwardly gripping relation with the material into which it is driven and receive and retain enough material in the space therebetween to prevent contraction of the spread apart legs on attempted withdrawal of the nail.

A further object of the invention is to leave no void in the material into which the nail is driven, by having the outside dimensions at the head end of the legs substantially the same as or greater than at the penetrating end and with the curved side or sides causing the legs to spread apart on driving.

A further object is a nail whose legs spread more easily on driving because the legs do not deform when spreading and therefore can be driven into a soft, freshly poured base of roof material such as vermiculite, perlite or the like.

A further object is to have the penetrating ends of the legs spread apart without causing the body of the legs to change shape.

A further object is a nail of the type described in which the legs may be of a material of varying degrees of stiffness as they need not be bendable in driving.

A further object is a nail of such configuration that when its legs spread in driving they will fill up with the material into which it is driven and will retain the same end thereby keep the legs from contracting upon withdrawal.

A further object is a large headed nail of the type described made of one piece.

A further object is a nail of the type described which is of minimum weight and inexpensive to manufacture.

A further object is a hollow nail with two channel shaped legs hinged at the head end of the nail and free to spread apart at their penetrating end.

A further object is a nail of the type described in which the sides of one leg nest substantially their full width within the sides of the other leg so that during the spreading apart of the legs there is a minimum of opening through which the plug of material from the material into which the nail is driven may escape.

A further object is a nail of the type described in which the penetrating ends are blunt, not pointed, to insure greater retention of the plug of material the full length of the legs, on withdrawal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective looking upwardly from the penetrating end of a nail in accordance with the present invention to the underside of the cap;

FIG. 2, a plan of the cap;

FIG. 3, an elevation showing the curved sides;

FIGS. 4 and 5, sections on the lines 4—4 and 5—5, respectively, of FIG. 2;

FIGS. 6 and 7, sections on the lines 6—6 and 7—7, respectively, of FIG. 3;

FIG. 8, a section on the line 8—8 of FIG. 2;

FIG. 9, a plan of the blank;

FIG. 10, a view illustrating the nail just prior to being driven into a base, and similar to FIG. 3;

FIG. 11, a view partly in section of the nail partially driven into the base;

FIG. 12, a view partly in section of the nail fully driven into the base;

FIG. 13, a view partly in section of the nail, indicating the position of the parts upon partial withdrawal; and

FIG. 14, a section on the line 14—14 of FIG. 12.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The nail of the present invention is primarily adapted for use with relatively soft or plastic materials, such as a freshly poured deck in which the aggregate is of lightweight material.

The nature of the material into which the nail is driven is significant. The nail of the present invention is not intended for use in fibrous materials, such as wood and manufactured boards. Nails used with such materials require a sharp point to push down between the fibers. A nail in accordance with the present invention does not have a sharp point and is not adapted to be driven into such board.

Poured materials such as lightweight insulating concrete of the type described sets up gradually over a period of time. Immediately after pouring, an ordinary perlite or vermiculite mix may be too plastic to permit walking on for laying and fastening soft material, such as roofing felt. After approximately 3 days, however, it sets up enough to be walked on and to cause the nail as disclosed in this invention to spread and to hold adequately long before the approximately 4 week drying period.

The nail has a head or cap portion 10 and a pair of channel shaped leg portions 11 and 12. Referring to FIG. 9, the blank illustrated is converted to the finished nail by folding the outer flaps 14, 15 and 14' and 15' on the longitudinal fold lines 16, 17, 16' and 17' as the central portions 20, 20' of the legs are curved inwardly as indicated in FIG. 3. The neck portions 21, 21' are folded back over the cap on the lines 22, 22' and the legs are bent on the lines 24, 24' so that they extend outwardly from the cap as indicated in FIG. 3. In order to secure the legs to the cap, spot welds 25 between the cap and the underlying portion of the necks 21, 21' are provided. Since the legs nest together it is necessary

that the sides or flaps of one be formed slightly further apart than the other.

While the nail may be made in various sizes, and of sheet metal or plastic, it has been found that a suitable size is sheet metal approximately 0.012 inch thick with a shank approximately 1¼ inches long, and of a breadth approximately ⅜ inch and a head of approximately 1¼ inches in diameter. With such nail the curvature of the central leg portions 20 and 20' is on an approximately 6 inch radius. Only the central portions are curved, the outer portions 14, 15, 14', 15' being straight.

It will be observed (see FIG. 10) that the cross section of the shank "a" immediately beneath the head, and "b" at the penetrating end are substantially equal. Thus, when the nail is driven, the size of the opening which is made by the penetrating end is not materially larger than the size of the shank immediately beneath the head, thereby avoiding an enlarged opening which would be the case if the cross section b were larger than the cross section a.

The finished nail has a shank with a horizontal cross section as indicated in FIGS. 6 and 7. The longitudinal cross sections are as indicated in FIGS. 4 and 5.

Since the nail is intended for relatively soft or plastic material, its end is not required to be pointed as in most of the prior art. The absence of a point provides more material at the penetrating end than if a point were present, thereby increasing the surface area available for holding against withdrawal due to the clinging action of the material with the nail.

In use, the nail is driven into the material as indicated in FIGS. 10, 11 and 12. The curved portions 20, 20' cause the legs to diverge substantially but major portions of the sides overlap each other when the nail is fully driven as indicated in FIGS. 12, 13 and 14. This results in a substantial amount of the base material B being trapped between the sides of the legs. Such core of base material cannot escape at the sides due to the overlap of the legs. Upon the attempted withdrawal of the nail, the legs resist withdrawal due to the trapping of the core of material between the legs and the material on the outside of the legs and in close contact therewith. This area of contact extends the full dimension of the nail due to the absence of a point as previously mentioned. The attempted withdrawal tends to force the legs inwardly. However, this is resisted by the core material which is trapped, especially that where the legs overlap, and which cannot escape at the sides. Both the curved portions 20, 20' and the straight sides 14, 15, 14', 15' cling tightly to the trapped plug and resist withdrawal. An additional factor is that during driving, the core of material becomes compressed and therefore the material is in tight contact with the inside surface of the legs.

Applicant has found through tests that the nail of the present invention can resist 50 to 100 pounds withdrawal force when used in a base material such as freshly poured vermiculite or perlite within approximately three days after it is poured. This is a substantially larger holding force than devices of the prior art.

What is claimed is:

1. A nail for attaching covering material to a building material, said nail comprising a head and a shank, the shank having a penetrating end, said shank including at

least two legs flexibly joined at one end to said head and free to move apart along their length, at least one of the legs being substantially channel-shaped in transverse cross-section, said legs being in overlapping relationship and defining a hollow enclosure prior to being driven, at least a portion of said enclosure intermediate the ends thereof having a cross-sectional area less than the cross-sectional area at said one end, said portion including means to cause at least portions of said legs to spread apart when driven into engagement with said building material while other portions of said legs remain in overlapping relationship, whereby a plug of material is retained between the legs which maintains them in spread position in order to increase the resistance to withdrawal.

2. The invention as defined in claim 1 in which each of said legs is generally U-shaped in cross-section and said legs are substantially oppositely disposed.

3. The invention as defined in claim 1 in which each leg has three sides, two of which are straight and joined together by the third side, at least a portion of the third side being inclined inwardly toward the centerline of the nail.

4. The invention as defined in claim 1 in which the intermediate oppositely facing portions of each of the legs is curved inwardly.

5. The invention as defined in claim 2 in which the cross-sectional area of the shank adjacent to the head and adjacent to the penetrating end are substantially of equal size and in which the cross-sectional area intermediate the ends is of reduced size.

6. The invention as defined in claim 5 in which each leg has multiple sides, a portion of at least one side of each leg overlapping a side of an adjacent leg.

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