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G. F. CHALFONT ET AL

2,687,666

FASTENING DEVICE

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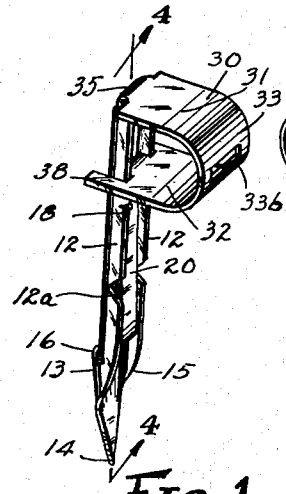


FIG. 1

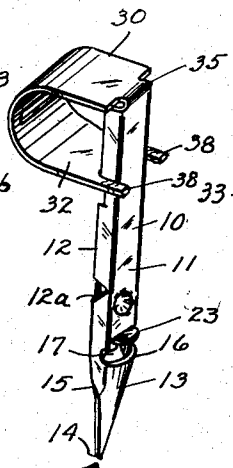


FIG. 2

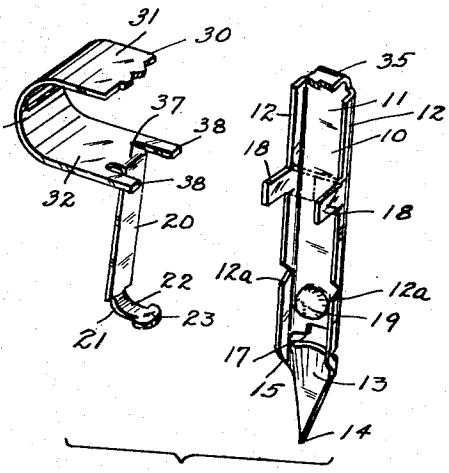


FIG. 3

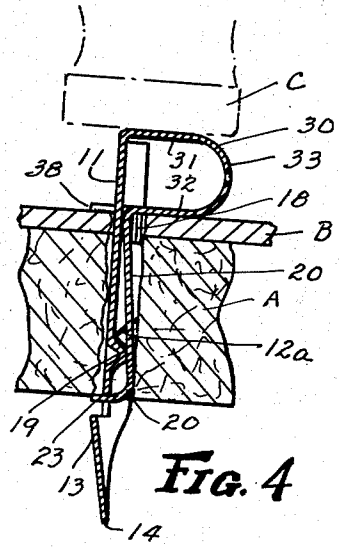


FIG. 4

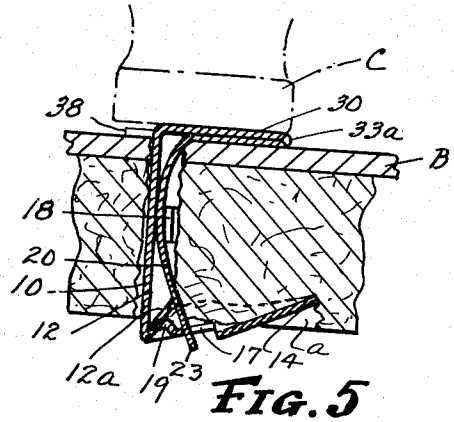


FIG. 5

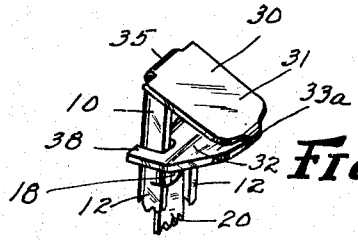


FIG. 6

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FASTENING DEVICE

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9 Claims. (Cl. 85—11)

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This invention relates to a fastening device of the type generically known as a self-clinching nail, comprising a member so formed that it may be driven through a support and will automatically clinch itself on the inner side of the support, thereby being adapted to attach an object permanently to the support.

A primary object of the invention is to provide a device of the character stated which while being very light will be effective in automatically forming its own hole through the support as it is put into place, and when in place will hold itself in position with great firmness, thereby retaining the attached device against displacement and preventing any inadvertent loosening of the fastener.

Another object of the invention is to provide such fastening device so formed that it may be manufactured from sheet material, and still will have the desired strength and firmness. Another object is to provide such a fastener in a form enabling it to be made by simple stamping and bending operations from a single piece of sheet material.

Our invention is hereinafter more fully explained in connection with a preferred embodiment illustrated in the drawings and the essential novel features are summarized in the claims.

In the drawings, Fig. 1 is a perspective of one form of our device; Fig. 2 is a perspective of the same device looking from the opposite side thereof; Fig. 3 is a separated perspective of two portions of the integral device shown in Figs. 1 and 2, before the final formation thereof; Fig. 4 is a longitudinal section of the device indicated by the line 4—4 on Fig. 1, showing it in position passing through a suitable support and a member to be attached before the final clinching operation; Fig. 5 is a cross section of the device as finally positioned on the support; Fig. 6 is a fragmentary section of the head portion of a modified form of the device.

Our fastening device, while being a single integral piece, may be considered as comprising a main leg 10, a shorter secondary leg 20, and a loop or return bent portion 30 connecting the two legs. Each of these three portions has characteristics of its own, which will now be described.

The main leg 10 is a channel-shaped member having a substantially flat longitudinal web 11 and two edge flanges 12, these flanges lying in planes at right angles to that of the web. The lower end of the web is concavo-convex, as shown at 13, and is brought to a point 14 and the flanges 12 are gradually cut off as they lead to the curved

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edges of the point portion, as indicated at 15, Fig. 1. The concaving of the triangular end portion of this leg throws the upper end of the curved part outwardly beyond the plane of the web as shown at 16.

The secondary leg 20 comprises a relatively narrow strip lying between the side flanges 12 of the primary leg and having a tongue 21 extending through the primary leg and anchored thereto. As shown the anchorage is effected by making the tongue 21 intermediately relatively narrower than the leg 20 and then enlarged at the end as shown at 23. The tongue is passed through an opening 17 in the leg 10, and the narrow neck 22 then caused to occupy a narrowed upper portion of the opening with the end 23 overhanging the outer face of the web as shown in Fig. 2.

The portion 30 of the device which connects the two legs and is integrally formed therewith comprises an area of sheet material doubled on itself to provide an upper arm 31 integral with the leg 10, a lower arm 32 integral with the leg 20 and a bent portion 33, Figs. 1 to 5, or 33a, Fig. 6, connecting the upper and lower arms of this head. Integral connection of the arm 31 with the leg 10 is by a portion 35 of reduced width which joins the web of the main leg 10. The connection of the lower arm 32 to the secondary leg 20 is likewise a narrowed bent portion, as shown at 37, Fig. 3. The arm 32 preferably continues beyond the leg 20 in the form of projections 38 which extend across and beyond the side flanges 12 of the leg 10, as shown.

Formed on the two side flanges of the leg 10 are a pair of integral tongues 18 which are bent over onto the outer side of the leg 20 within the channel of the leg 10, thus returning that leg within the channel at the head end of the device.

The retaining wings 18 of the leg 10 are so positioned along the leg that when the device is finished these bent wings lie against the undersurface of the underarm of the head. This prevents the underarm of the head inadvertently being moved downwardly, thereby inadvertently freeing the head 23 on the tongue from its locking engagement with the web of the main leg. Accordingly, when the device has been formed it retains its condition as shown in Fig. 4, until it is driven into place.

Formed on the web 11 of the primary leg is a projection 19 which normally bears against the leg 20, as shown in Fig. 4, this projection being preferably made by an indentation in the web. The flanges of the member 10 are weakened a

short distance above the projection **19** to localize the region of bending. In some of the claims the weakening portion is stated to be effectively between and head portion and the interlock formed by the anchorage of the tongue **21** in the opening **17**. This means that the interlock is positioned so that it will act against a portion of the leg mass which mass lies below the weakening to bend such leg mass laterally when the head is collapsed. This weakening is readily effected by cutting V-shaped notches **12***a* in the flanges **12**.

The connecting bend **33** of Figs. 1 to 5 is weakened by means of a slot **33***b* cut through the crest of the bend as shown in those views. In the construction of Fig. 6, the connecting portion between the two arms of the head **33***a* is sufficiently narrow so that that region of the head is materially weaker than elsewhere.

The device described is readily made out of a single narrow strip of sheet material, preferably spring steel. The blank is cut to shape and then formed and flanged as illustrated in Fig. 3. The tongue **21** on the secondary leg is then passed through the larger portion of the opening **17** and shoved upwardly so that the head **23** lies back of the web of the leg **10**, then the wings **18** on the flanges **12** are bent over onto the outer side of the secondary leg.

The forming operations described produce such a device as shown in Figs. 1, 2 and 4. It will be seen that in this device the projection **19** on the main leg bears against the secondary leg and holds it slightly spread from the main leg with the head **23** on the tongue in engagement with the outer face of the web **11** on the main leg. This insures the main leg bending in the desired direction in the final sealing of the device as hereinafter explained.

In Figs. 4 and 5, we have indicated at A, suitable supporting member and at B a member or plate adapted to be attached. In applying my self-clinching nail to such members, its point is placed against or passed through the member to be attached and then it is driven as by a hammer blow through the support. Such hammer acts against the flat outer face **31** of the head as indicated by the dotted lines C in Figs. 4 and 5.

The fastening device retains its form as it is being driven into place until the inner member **32** of the head comes to a stop by engaging the outer face of the member to be attached. Fig. 4 indicates the condition at this time. Now as the hammer blows continue, the head is flattened thereby and the main leg moves farther through the support, but the secondary leg, being now anchored at its upper end by the head arm **32**, cannot move downward. Accordingly, as the longer leg passes downwardly the part thereof beyond the tongue **21** of the supplemental leg is held from further longitudinal movement and hence this part bends laterally. The weakening of the main leg flanges at **12***a* allows such lateral bending in the direction toward the secondary leg, and the tendency to bend in this direction is increased by the projection **19** forcing the secondary leg to be spread slightly from the primary leg as shown in Fig. 4.

The result is that immediately after the head has engaged the article to be attached the portion of the main leg beyond the support bends laterally and by reason of its intermediate anchorage by the head **23** on the secondary leg is caused to assume a position projecting more or less nearly at right angles to the shank of the

main leg. The final position of the inner portion of the main leg is indicated in Fig. 5.

When the nail is driven through a support A which has a thickness bearing such ratio to the length of the nail as shown in Fig. 4, the end portion of the nail in the final position will be embedded in the inner portion of the support, as indicated at *a* in Fig. 5. In use, one of our nails will be selected of a length bearing a proper relation to the thickness of the support into which it is to be driven. However, considerable latitude is allowed, as the device will hold itself firmly in place if the support is thinner than that indicated and the nail bent more acutely on itself, or is thicker than that shown and the bent end of the nail bears merely against the rear surface of the support without becoming embedded therein.

With the embodiment of Fig. 6 the operation is identical with that described. In each case the ready flattening of the return-bent head of the fastener under the hammer blows is insured by the weakening of the bend.

We claim:

1. A fastening device comprising a long leg formed with a web and edge flanges to give it a longitudinal channel shape, a short leg narrower than the long leg seated in the channel thereof, a loop of material bent on itself to provide outer and inner arms, the outer arm of the loop being connected to the long leg and the inner arm to the short leg, the end portion of the short leg being connected to an intermediate region of the long leg and the flanges on the long leg being weakened above such connection, whereby the long leg is caused to be bent as the head of the device is collapsed.

2. A fastening device made of a single strip of sheet material and comprising a main leg having edge flanges providing a channel-shaped body, one end of the body being tapered to bring it to a point, a secondary shorter leg narrower than the main leg lying between the flanges thereof, a return bent portion forming a head and having two arms connected to the other ends of the legs, said return bent portion being weakened at the bend, the inner end of the short leg having a tongue projecting through an opening in the long main leg with a head on the tongue beyond the long leg, a pair of wings on flanges of the long leg bent across the short leg adjacent the return bend, and a projection on the long leg between the flanges bearing against the short leg to spread its inner end from the long leg, the flanges being weakened in the general vicinity of the projection, whereby when the device is forced into the work until the inner arm of the collapsible head engages the work, further movement of the long leg coincident with the collapsing of the head causes the long leg to be bent transversely of the short leg and to extend across and beyond it.

3. A fastening device having a pair of legs of different length lying alongside of each other, one leg having edge flanges providing a channel in which the other leg is seated, a collapsible portion connecting an end of the two legs, said flanges having notches to weaken them in an intermediate region, and the short leg having a tongue extending through an opening between the edge flanges in an intermediate region of the long leg.

4. A fastening device made of a single piece of sheet material bent to provide a pair of legs of different length and an intermediate connecting

portion, the long leg having edge flanges providing a channel in which the short leg is seated, and said short leg having an integral portion extending through and engaging an opening between the edge flanges in an intermediate region of the long leg, the flanges of the long leg being weakened above the region of engagement.

5. A fastening device comprising a member having a pair of legs of unequal length alongside of each other and a collapsible head connected to one end of the two legs, the short leg having a tongue portion extending through and engaging an opening in an intermediate region of the long leg, and a projection on the long leg bearing against the short leg above the engagement to spread the lower portion of the short leg from the long leg.

6. A fastening device made of an integral strip bent to provide a main leg of channel-shape, a secondary leg lying within the channel of the main leg and a return bent portion having two arms, the outer arm connected to an end of the main leg and the other arm to an end of the secondary leg, wings on the side flanges of the main leg embracing the secondary leg to hold the two legs together, a projection on the main leg engaging the lower portion of the secondary leg to spread it from the main leg, the secondary leg beneath the projection having a tongue portion extending through an aligned opening between the flanges in the main leg to establish an anchorage, and the flanges on the main leg weakened above such anchorage.

7. An integral fastener comprising two legs of unequal length connected together at one end of the device by a collapsible head portion, the long leg being channel-shaped in cross section and receiving the other leg therein, the long leg having an opening therein and the other having a tongue, said opening and tongue being spaced from the collapsible head portion and disposed opposite each other and providing an interlock between said legs, and one of said legs having a weakened portion therein, said weakened portion being effectively between said head portion and said interlock, said interlock between the legs operating when the collapsible head portion is collapsed to effect a bending action of said latter one of the legs about the weakened portion therein.

8. The fastener of claim 7 wherein wings are provided on one of the legs and are bent around the other leg to retain the two legs adjacent each other.

9. The fastener of claim 7 wherein the opening in one of the legs has a restricted portion and wherein wings are provided on one of the legs and bent around the other in position to engage the underside of the collapsible head to hold the tongue interlocked in the restricted portion of the opening.

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