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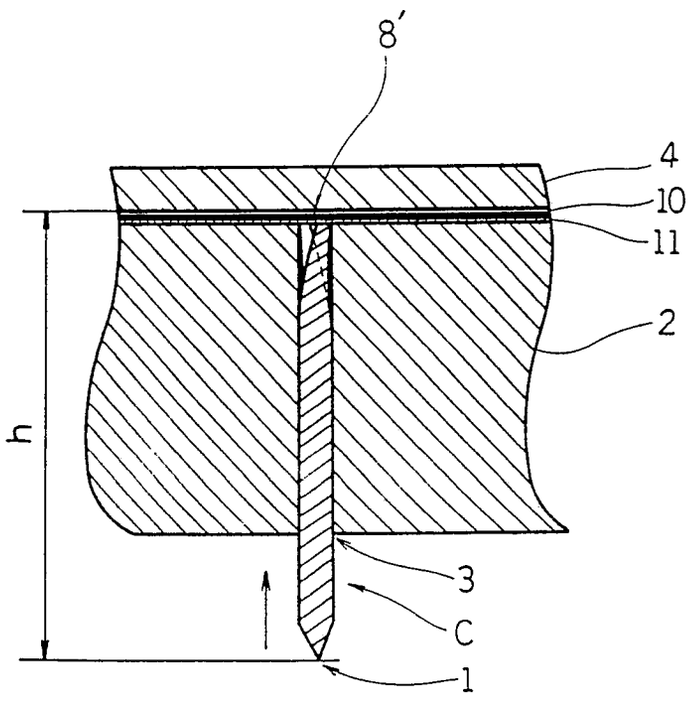
(54) Knife for blanking in sheet.

(57) A knife (C) for blanking in thin sheet material. the knife (C) having a back portion (8') that is bevelled. said back portion (8') having a fluted or wave-shaped configuration such that the flutes extend the full width (t) of the knife (C).

Fig 2



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Knife for Blanking in Sheet

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a knife for blanking in a sheet of thin strip (referred to as a knife hereinafter), which is utilized to punch a specifically shaped hole in a sheet of paper, plastic, or corrugated paper board by press blanking.

Description of the Prior Art

A knife in the prior art, for example, shown in Figs. 5 and 6 has been introduced.

The prior art knife A illustrated is of thin strip (of thickness ranging from 0.4 to 1 0 mm) and has two bevelled surfaces in its blade end. It is formed of wedge-like shape in cross section. The knife A is fixedly fitted, for use, in a knife fitting groove 3 arranged in a knife holding base 2 made of wood.

The knife fitting groove 3 is preliminarily formed into a determined configuration (according to the shape of a blank) with the use of a jig saw or by means of laser cutting. In case that the knife fitting groove 3 is cut by the laser cutting operation which has widely been employed recently, the widthwise measurements of the inner region of the knife fitting groove 3 may be found unequal although the cutting into an intricate configuration is possible. If the knife A is fitted into the knife fitting groove 3 under such a condition, the knife holding base 2 becomes deflected. Thus, the knife fitting groove 3 should be finished appropriately with the use of a router.

The knife holding base 2 equipped securely with the knife A is then attached to a blanking press (not shown) together with a thin ferrous plate 11, a paper sheet 10, and a back plate 4. Particularly, while the knife A is fitted into the knife fitting groove 3, its height h alters to a very slight degree at the corner portions 5 of the knife A and thus, should appropriately be adjusted by the operator prior to blanking operation. At the same time, an inherent error in the height h of the knife A is also corrected.

During trial blanking operation, this adjustment is made in a such way that a sheet of height adjusting paper such as a strip of tape 7 is adhesively mounted between the thin ferrous plate 11 and the back plate 4 to an area where the height h of the knife A is rather low (See Fig. 6). Additionally, the error in the height h of knife A is eliminated by deflecting the thin ferrous plate 11 throughout the area.

However, the aforesaid adjustment requires a highly experienced technical skill and particularly, has a disadvantage that it is troublesome to carry out.

On the other hand, a knife B shown in Fig. 7 has been developed.

The knife B has a back portion 8 thereof formed in thinner relationship into a tapered configuration, as shown in Fig. 7. The thinner portion can easily be deformed under pressure.

The knife B in such an arrangement is also fitted into a knife fitting groove 3 formed in a knife holding base 2. Then, the knife holding base 2 is attached to a blanking press together with a thin ferrous plate 11, a paper sheet 10, and a back plate 4. During test blanking operation,the back portion 8 is yieldingly compressed upon forcefully pushing the thin ferrous plate 11. Consequently, the knife B is partially adjusted automatically so that its height h can be uniform.

However, in the arrangement of the knife B, the back portion 8 is tapered and rather thinner in shape, as described above. This causes the knife holding base 2 to deflect fairly when the knife B is inserted into the knife fitting groove 3 under pressure.

As a result, a problem may arise such that during press blanking operation, a sheet such as a corrugated paper board 12 transported on a chain conveyor not shown is not transferred smoothly as with its leading end striking the blade end 1 of the knife B attached to the knife holding base 2 (See Fig. 8).

Particularly, the problem is likely to become more troublesome because the distance H between the blade end 1 of the knife B and the top of the corrugated paper board 12 is substantially adjusted to a small value (e.g. 4 to 5 mm) in relation to the speed-up in press blanking operation required in these days.

Additionally, there is another problem that the holding force of the knife holding base 2 for holding the knife B is lessened as the contacting area of the knife B to the side wall of the knife fitting groove 3 decreases particularly in the thinner region of the back portion 8.

SUMMARY OF THE INVENTION

The present invention is designed in view of the above mentioned aspects.

The present invention is directed toward a knife having a back portion thereof formed in thinner relationship and fixedly fitted in a knife fitting groove arranged in a knife holding base, in which the back portion is repeatedly flexed thicknesswisely thereof.

For the reason that the back portion of the knife is repeatedly flexed thicknesswisely thereof although it is less in thickness, an extended contacting area thereof to the side wall of the knife fitting groove can be ensured. Accordingly, the holding force of the knife holding base for holding a knife is increased. Additionally, the pressing forces on the side wall of the knife fitting groove become uniform, whereby the deflection of the knife holding base will be minimized.

Furthermore, for adjustment of the height of knife, the height of the knife is automatically adjusted to be uniform as higher ends of the back portion thereof are yieldingly compressed upon forcefully striking the thin ferrous plate. Thus, an operator who is less experienced in the adjustment can carry out the operation of adjustment with ease.

Moreover, when the knife is fitted into the knife fitting groove in the knife holding base, the back portion thereof will deflect according to the width of the knife fitting groove or else, the contacting areas of the side wall of the knife fitting groove to the back portion will partially yield to pressure under the stresses exerted intensively thereon. Accordingly, the work of finishing the knife fitting groove with a router may be omitted.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1 (a), 1(b), and 1 (c) illustrate one embodiment of the knife of the present invention, in which:

Fig. 1 (a) is a perspective view; Fig. 1 (b) is a plan view taken from the direction of arrow E of fig. 1 (a); and Fig. 1 (c) is a cross sectional view taken along the line F-F′ of Fig. 1 (a).

Fig. 2 is a cross sectional side view showing that the knife is fixedly fitted in a knife fitting groove arranged in a knife holding base while the height of the knife has been adjusted.

Fig. 3 is a perspective view showing another embodiment of the knife of the present invention.

Fig. 4 is a view similar to Fig. 1 (c), showing a further embodiment of the knife of the present invention.

Fig. 5 is a perspective view showing the knife prior to installation to a knife holding base explanatorily in respect of an background art of the present invention.

Fig. 6 is a view similar to Fig. 2, showing a prior art knife.

Fig. 7 is a view similar to Fig. 2, showing another prior art knife.

Fig. 8 is an explanatory view showing an operation of press blanking.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Similar elements including such as those of the prior art knives A and B shown in Figs. 6 and 7 are represented by similar numerals in this description.

A knife C in the primary embodiment has a back portion 8′ arranged in a thinner tapered shape and repeatedly flexed thicknesswisely thereof in wave-shaped relationship, as shown in Figs. 1 (a), 1 (b), and 1 (c).

The wave-shaped portion is formed by pressing operation so as to stay within a range of the thickness (represented by t in Fig. 1 (b)) of the knife C.

The knife C also has two bevelled surfaces in its blade end.

When the knife C in the above arrangement is fitted into a knife fitting groove 3 formed in a knife holding base 2, the convex sides of the back portion 8′ arranged in wave configuration come in contact with the side wall of the knife fitting groove 3. Thus, the contact areas of the knife C to the side wall of the knife fitting groove 3 are positively ensured with help of the spring action resulting from the wave form thereof. As a result, the holding force of the knife holding base 2 for holding the knife C will be increased.

Additionally, for the reason that the spring action is also effected by the back portion 8′ of the knife C, the knife C can be fitted into the knife fitting groove 3 as its back portion 8′ deflects throughout the knife fitting groove 3 or as the contacting area of the side wall of the knife fitting groove 3 to the back portion 8′ partially deflects due to a stress intensively exerted thereon, even in case that the knife fitting groove 3 is not uniform in width after having been cut e.g. by laser cutting operation. Therefore, a finishing work with the use of a router after laser cutting operation may be omitted.

The knife holding base 2 having the knife C fixedly fitted in the knife fitting groove 3 therein is then attached to a blanking press (not shown) together with a thin ferrous plate 11, a sheet 10, and a back plate 4. For adjustment of the height h of

the knife C, a region of the back portion 8 where the height h of the knife C becomes greatest is yieldingly compressed with the thin ferrous plate 11 under pressure during the test blanking operation (See Fig. 2). This allows the height h to become uniform automatically in adjustment.

Accordingly, when the adjustment of the height h of the knife C is carried out by the operator, it requires non of advanced technique and thus, will be accomplished with ease.

In another embodiment shown in Fig. 3, a knife G is arranged in such a way that its back portion 8' is formed into a plurality of tongues 9 alternately flexed thicknesswisely thereof.

In a further embodiment shown in Fig. 4, a knife D has a bevelled surface so as to form a blade edge 1.

This invention may be practiced or embodiment in still other ways without departing from the spirit or essential character thereof. The preferred embodiments described therein are therefore illustrative and not restrictive, the scope of the invention being indicated by the appended claims and all variations which come within the meaning of the claims are intended to be embraced therein.

Claims

1. A knife for blanking in sheet having a back portion thereof formed in thinner relationship and fixedly fitted in a knife fitting groove arranged in a knife holding base, characterized in that the back portion is repeatedly flexed thicknesswisely thereof.

2. A knife for blanking in sheet as defined in Claim 1 wherein the back portion is repeatedly flexed thicknesswisely thereof in wave-shaped relationship.

3. A knife for blanking in sheet as defined in Claim 1 wherein the back portion is formed in such a way that a plurality of tongues are alternately repeatedly flexed thicknesswisely thereof.

4. A knife for blanking in sheet as defined in Claim 1, 2, or 3 wherein its blade end has two bevelled surfaces.

5. A knife for blanking in sheet as defined in Claim 1, 2, or 3 wherein its blade end has one bevelled surface

Fig 1

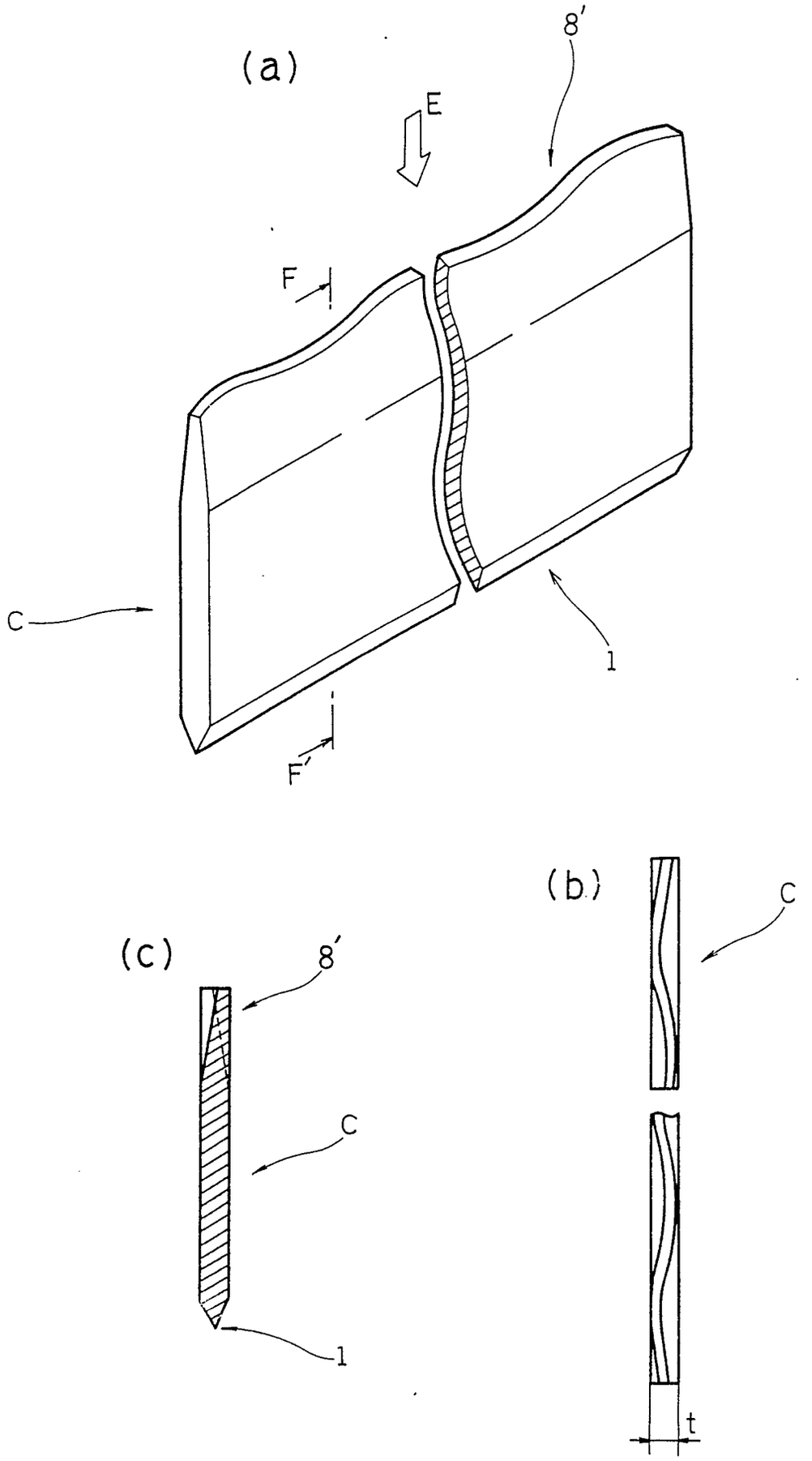


Fig 2

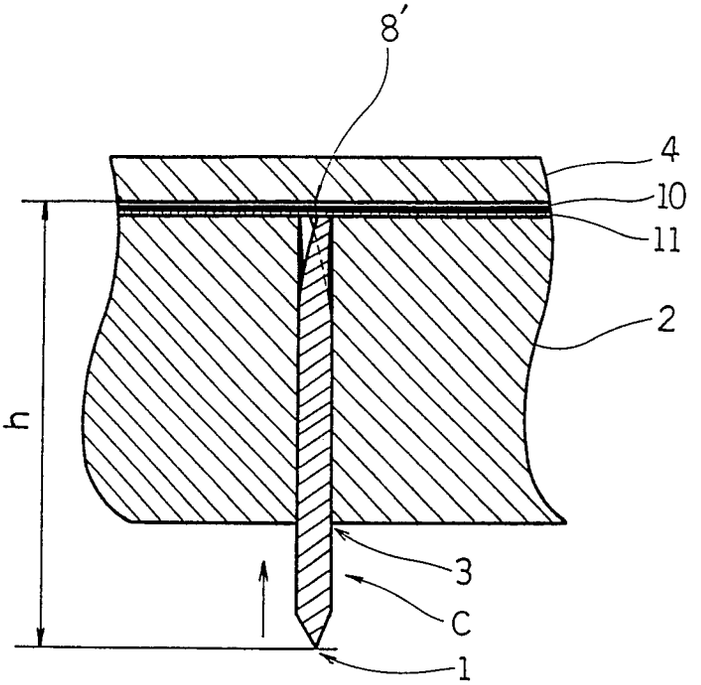


Fig 3

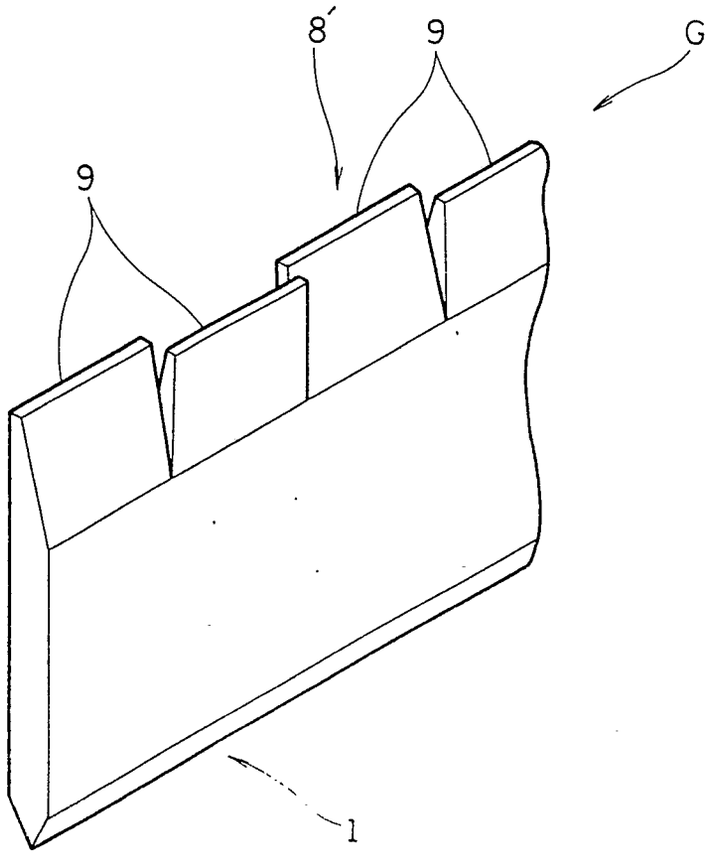


Fig 4

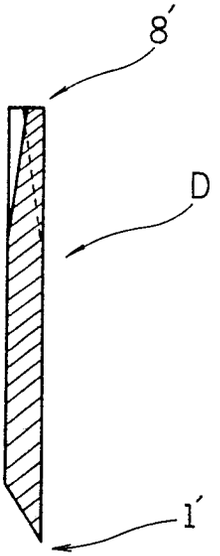


Fig 5

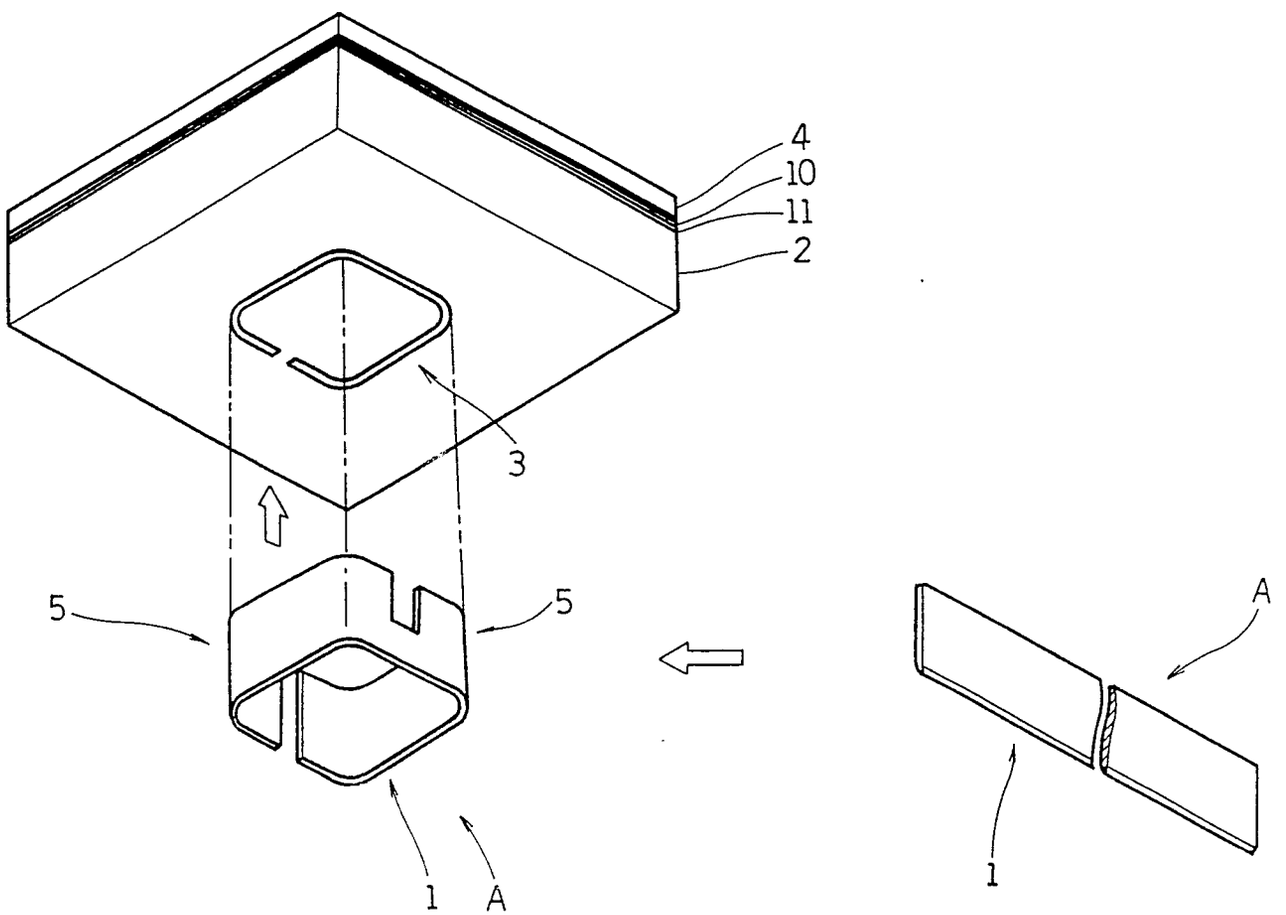


Fig6

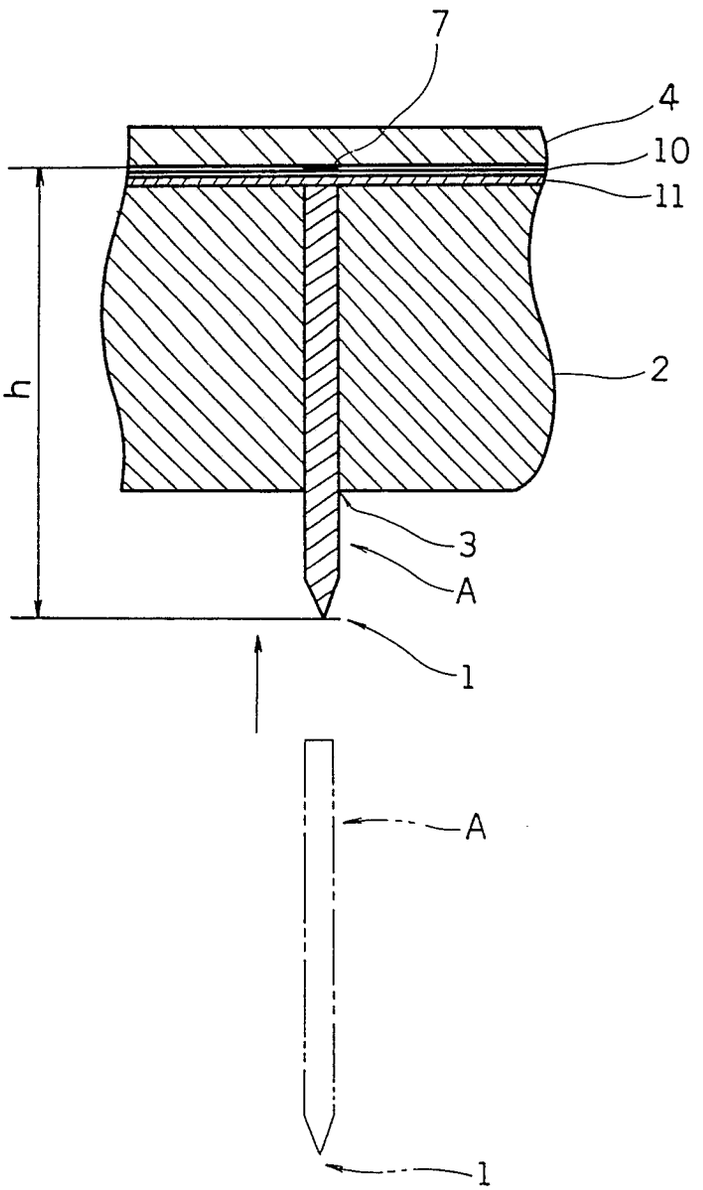


Fig 7

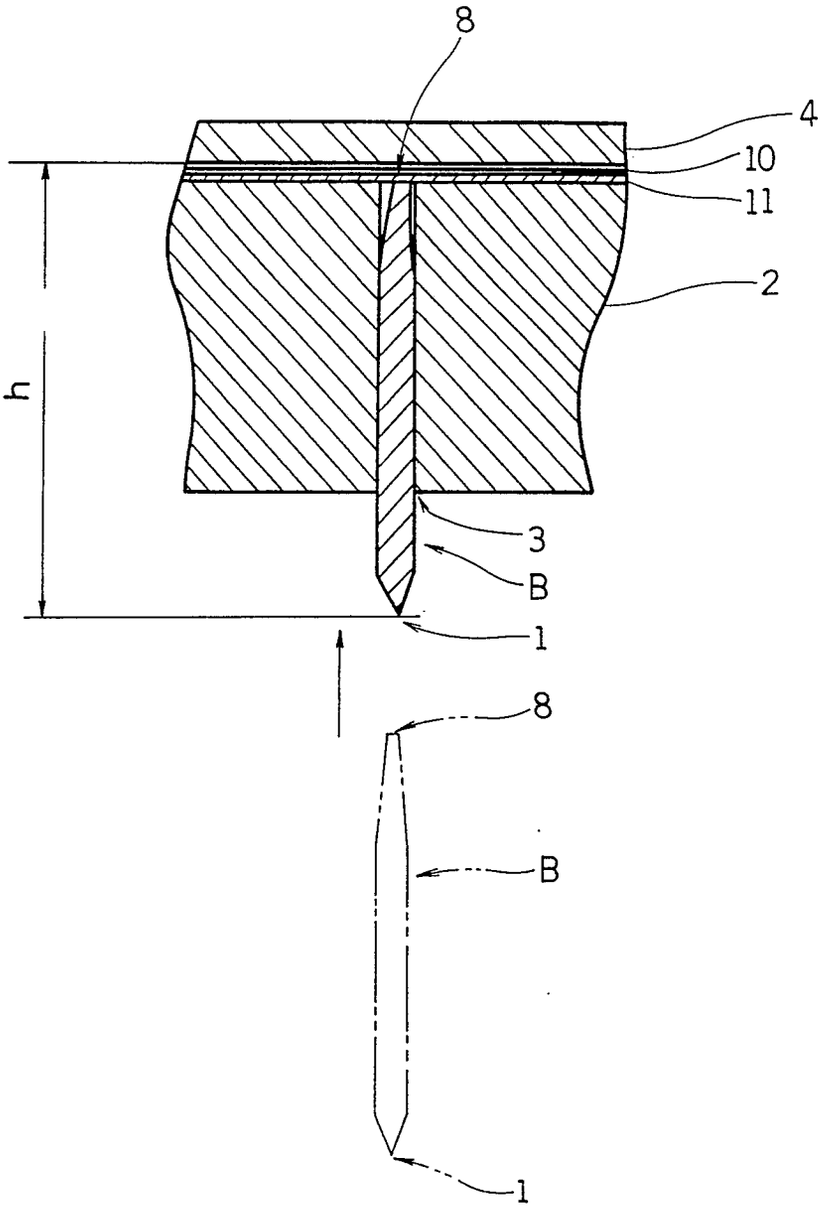
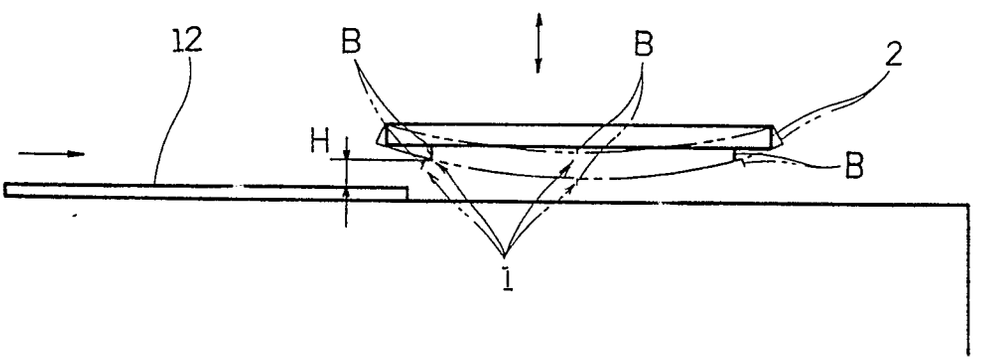


Fig 8



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EUROPEAN SEARCH REPORT

Application Number

EP 88 10 9208

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	GB-A-1 366 757 (COXHEAD) * The whole document *	1,4	B 26 F 1/44
A	FR-A-2 512 704 (MARBACH) * The whole document *	1,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 26 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21-10-1988	HUGGINS J.D.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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