Feb. 14, 1967 P. LANG 3,303,979

METHOD AND DEVICE FOR REMOVING PIECES FROM SHEET MATERIAL

Filed Sept. 7, 1965 3 Sheets-Sheet 1

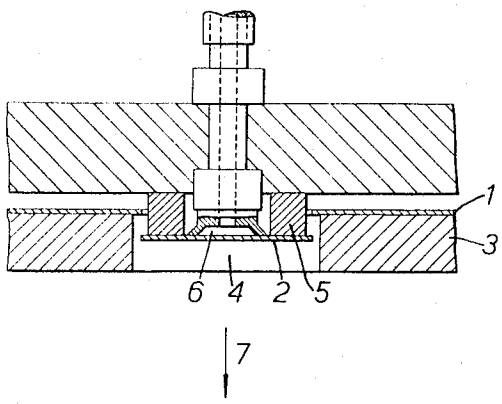


FIG. 1.

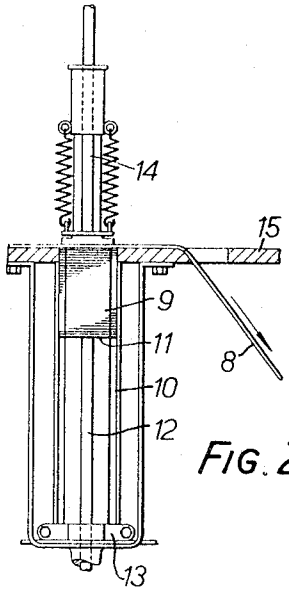


FIG. 2.

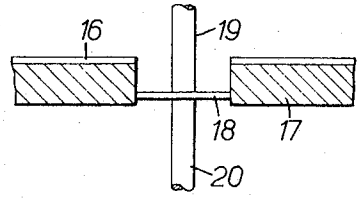


FIG. 3.

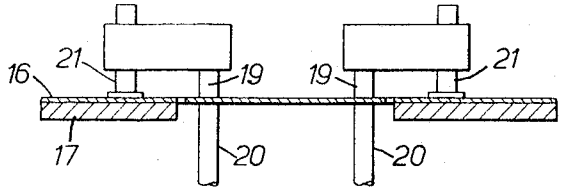


FIG. 4.

INVENTOR
PIERRE LANG

BY

Watson, Cole, Grindle & Watson

ATTORNEYS

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METHOD AND DEVICE FOR REMOVING PIECES FROM SHEET MATERIAL

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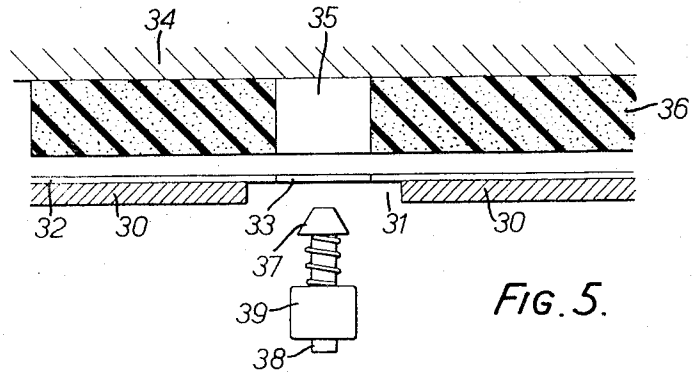


FIG. 5.

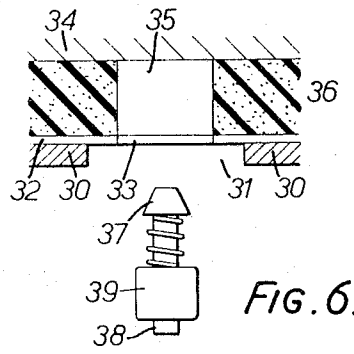


FIG. 6.

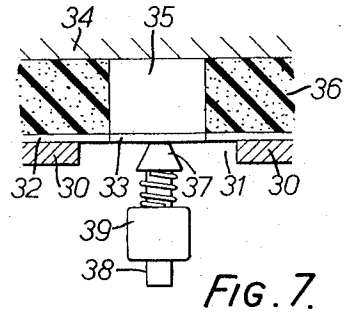


FIG. 7.

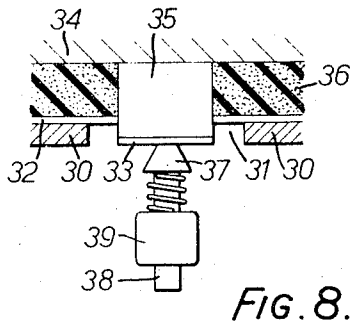


FIG. 8.

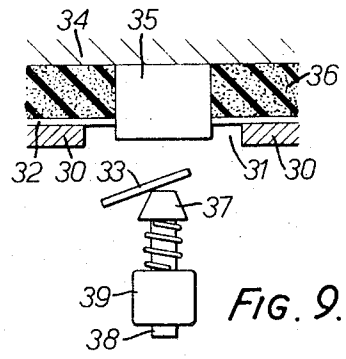


FIG. 9.

INVENTOR
PIERRE LANG

BY

Watson, Cole, Grindle + Watson

ATTORNEYS

Feb. 14, 1967 P. LANG 3,303,979

METHOD AND DEVICE FOR REMOVING PIECES FROM SHEET MATERIAL

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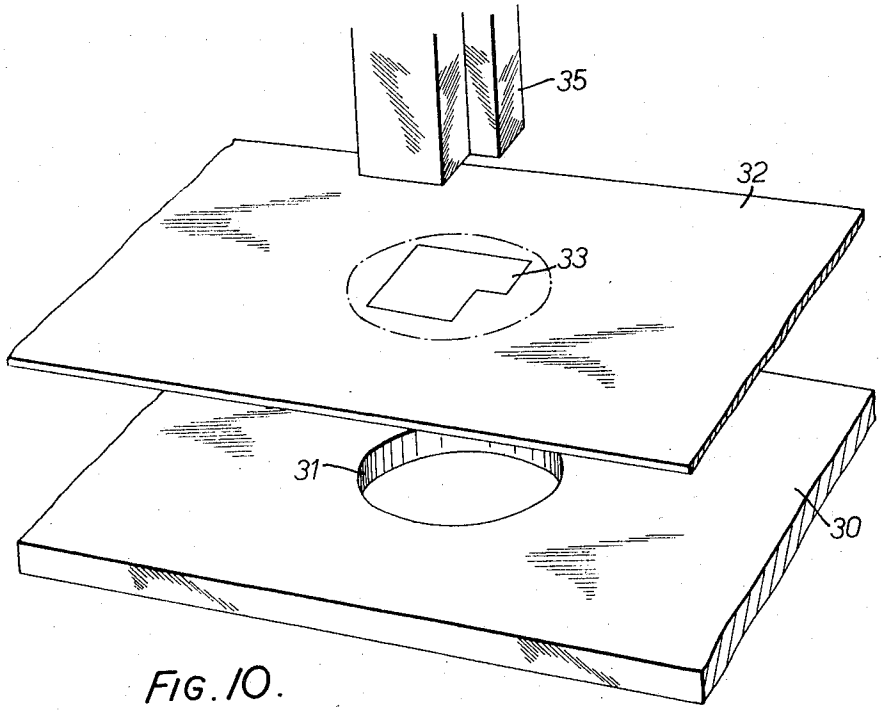


FIG. 10.

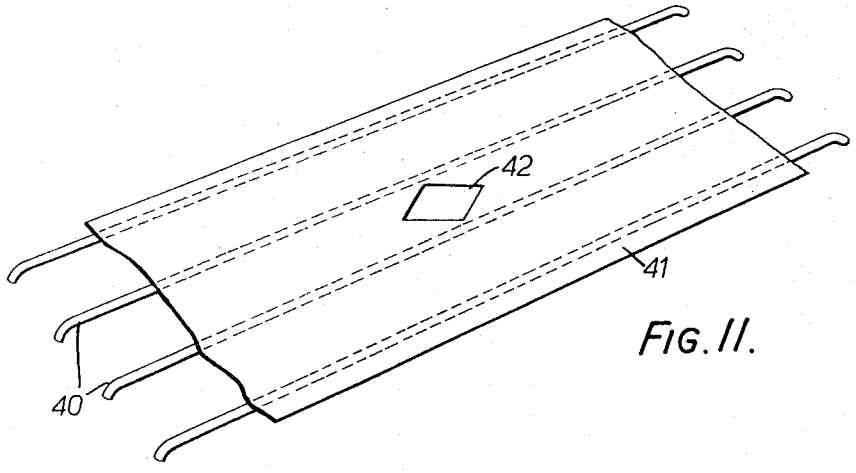


FIG. 11.

INVENTOR.
PIERRE LANG.

BY

Watson, Cole, Grindle & Watson

ATTORNEYS

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METHOD AND DEVICE FOR REMOVING PIECES FROM SHEET MATERIAL

Pierre Lang, 33b Chemin de la Foret,
Renens, Switzerland

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10 Claims. (Cl. 225—1)

This invention relates to a method and device for removing pieces from punched sheet material (which term is used herein to include both individual sheets and strips), for example in making carton blanks. The pieces removed will usually be waste, but in certain cases the pieces removed may be the desired articles, the rest of the sheet material being waste. The invention is equally applicable to both cases.

The punching operation does not completely sever the pieces from the rest of the sheet material, in order that the sheet material will remain a coherent whole while being transferred from the punching station to the waste-removal station, e.g. from a punching machine to a stripping device, since if pieces inadvertently becames completely detached during this transfer the operation of the plant might be interrupted. The removal of the pieces, which are still partly attached to the rest of the sheet material, has been tackled by two distinct methods, namely a method employing cylindrical stripping rollers which carry stripping needles, and a method in which the pieces are struck out from the flat sheet by members which move transversely to the sheet. It is with the latter method that the present invention is concerned. A problem which this method imposes is that the piece must be firmly held while it is being removed to ensure that all the fibres by which it is still attached to the rest of the sheet material are severed so that it is not merely folded down while still remaining attached at one or more places.

Four previous solutions to this problem will now be described with reference to FIGURES 1 to 4 of the accompanying drawings.

Referring to FIGURE 1, punched sheet material **1**, from which a piece **2** is to be removed, is placed on a template **3** having an opening **4** shaped to correspond to the shape of the piece **2** and through which the piece can be pressed out. A removing member **5** is provided with a suction cup **6**, so that when suction is applied thereto the piece **2** is gripped on both sides, by the air pressure on its underside pressing it against the member **5**. The removing member **5** is then pressed down in the direction of the arrow **7**, to tear the piece **2** from the rest of the sheet material **1** and push it through the opening **4**. The suction is then released to release the removed piece **2**, and the member **5** is retracted so that the cycle can be repeated.

Referring to FIGURE 2, the pieces removed from a strip of sheet material **8** form a stack **9** which is supported in guides **10** upon a platform **11** mounted on a rod **12**. This rod is frictionally gripped by a clamp **13** so that the stack is progressively forced downwards as more pieces accumulate upon it. These pieces are struck out of the strip **8** through a correspondingly shaped opening in a template **15** by a removing member **14** which is reciprocated by means not shown. As illustrated, the stroke of the member **14** is such that it forces the piece down by a distance approximately equal to the thickness of the strip **8** so that as each piece is being removed it is gripped between the member **14** from above and the previously removed piece from below.

Another proposal has been to provide mechanical means for gripping the piece to be removed while the rest of the sheet material is supported on a template and means for separating the levels of the piece and the rest of the sheet material by changing the relative position of the

gripping means and the template, after which the removed piece is released from its gripping means. The simplest form of this proposal is illustrated in FIGURE 3. In this arrangement the sheet material **16** is placed on a template **17** having an opening corresponding to the shape of the piece **18** to be removed. Rams **19** and **20** are brought mechanically into engagement with opposite sides of the piece **18** and are then moved downwards together as shown, carrying the piece **18** with them through the template, whereupon the rams are separated to release the piece **18** below the template. These rams have only a small surface of contact with the piece **18**, and for all except small pieces it is necessary to provide a plurality of pairs of rams at intervals around the piece, which complicates the apparatus and means that setting up the apparatus for pieces of different shapes and sizes takes a considerable time.

In practice that arrangement requires elaboration as illustrated in FIGURE 4, wherein each of the upper rams **19** is also provided with a member **21** for clamping the sheet **16** around the opening in the template **17**. The provision of these clamping members **21** increases the complication and the time required for setting up the apparatus.

In all the proposals described above it is necessary to place the sheet material upon a template, that is to say, a support having an opening therein conforming to the shape of the piece to be removed.

It is the object of the invention to provide a method and device that is less complicated than those described, and which avoids the need for a template and a plurality of removing members.

The invention may be performed in various ways to achieve this and other objects, and a specific embodiment, with a modification, will be hereinafter described by way of example with reference to FIGURES 5 to 11 of the accompanying diagrammatic drawings, in which:

FIGURE 5 is a cross-section of a device embodying the invention showing the parts in the "open" condition;

FIGURE 6 shows the parts with the sheet material clamped;

FIGURE 7 shows the parts with the piece to be removed gripped ready for removal;

FIGURE 8 shows the parts with the piece removed but still gripped;

FIGURE 9 shows the parts with the removed piece released;

FIGURE 10 is a perspective view of the removing device, the sheet material and the rigid support; and

FIGURE 11 is a perspective view of a modified form of rigid support with sheet material thereon.

According to one aspect of the invention, a method of removing at least one piece from punched sheet material comprises supporting the sheet material, gripping the piece between a removing member having a profile conforming to the shape of the piece and a gripping member, effecting relative movement between, on the one hand, the removing and gripping members and the gripped piece, and on the other hand the supported sheet material, to force the removing member together with the gripped piece through the supported sheet material, and then releasing the removed piece.

According to another aspect of the invention, a device for removing at least one piece from punched sheet material comprises a rigid support for the sheet material, a removing member having a profile conforming to the shape of the piece and mounted on the side of the sheet material opposite to the rigid support, a gripping member mounted on the same side of the sheet material as the rigid support, means for effecting relative movement between the gripping member and the removing member for gripping and releasing the piece, and means for ef-

fecting relative movement between, on the one hand, the gripping and removing members and the gripped piece, and on the other hand the rigid support and the rest of the sheet material for forcing the removing member together with the gripped piece through the rest of the sheet material.

By making the removing member of the same profile as the shape of the piece, the place can be gripped firmly against the end face of the removing member by a single gripping member, even though the latter may have only a small area of contact with the piece and the piece itself may be quite large. The need for a plurality of gripping devices is thus avoided. Moreover, by thus shaping the removing member, it is not necessary to employ a template having an opening conforming to the shape of the piece, provided of course that the sheet material is supported close enough to the piece to prevent excessive distortion of the sheet material while the piece is being removed. For example, the rigid support may comprise a plate having an opening therein substantially larger than the piece to be removed through the opening. Alternatively, the rigid support may comprise a plurality of spaced bars, preferably parallel bars. Such rigid supports can be used without alteration for the removal of pieces of a variety of shapes and sizes, only the removing member having to be changed. It is generally considerably easier and cheaper to shape an external profile, as of the removing member, than an internal profile such as an opening in a template. If the removing member is made of wood the shaping can be accomplished very easily and at low cost.

Although it is possible for the rigid support to be fixed and to move the removing member, it is preferred to mount the removing member fixedly and to move the rigid support.

In one form of the invention there is also a resilient support for the sheet material, on the same side as the removing member, the sheet material being clamped between the rigid and resilient supports during the removal of the piece.

Preferably, the resilient support is compressed during the removal of the piece and allowed to expand thereafter so that it serves to strip the remainder of the sheet material off the removing member, by continuing to press this material towards the rigid support while the movable parts are returning to their original positions after a piece has been removed. This is conveniently done by providing a common mounting, preferably a fixed mounting, for both the removing member and the resilient support, the rigid support carrying the sheet material being reciprocated towards and away from that fixed mounting. The resilient support conveniently consists of sponge-like material, such as a resilient plastic or rubber foam. It may be in the form of a sheet surrounding the removing member, or may be in the form of strips or pads.

Referring now to FIGURES 5 to 10, the device illustrated consists of rigid support **30** having an opening **31** therein. The support **30** supports sheet material **32** from which a punched piece **33** is to be removed. The opening **31** does not have to conform to the shape of the piece **33**. For example, this opening may be circular whereas the piece **33** is polygonal, as shown in FIGURE 10. Mounted on a fixed part **34** of the device is a removing member **35**. This is conveniently a block of wood shaped to have a profile corresponding to the shape of the piece **33**. Also mounted on the fixed part **34** is a layer of rubber or plastic sponge **36** which constitutes a resilient support for the sheet **32**. In its uncompressed state as shown in FIGURES 5 to 7 the thickness of the sponge layer **36** is the same as the depth of the member **35**. The rigid support **30** is mounted for reciprocation, by any suitable conventional mechanism such as a cam or crank mechanism (not shown) towards and away from the fixed part **34**. Below the rigid support **30** there is mounted a gripper member comprising a head **37**, a stem **38**, a guide **39** and spring **40** which urges the head **37** upwards in relation to the guide **39**. The guide **39** is also mounted for reciprocation, by any suitable conventional mechanism such as another cam or crank mechanism (not shown) towards and away from the fixed part **34** and the removing member **35** fixed thereon. The said mechanisms for reciprocating the rigid support **30** and the guide **39**, being of conventional construction well understood by those skilled in the art need not be enlarged upon or described in detail herein.

The operation is as follows.

With parts in the "open" condition shown in FIGURE 5 the sheet **32** is placed on the rigid support **30**. The rigid support **30** is then raised to clamp the sheet **32** between the rigid support **30** and the resilient support **36**, with the piece **33** lying against the flat end of the removing member **35** (FIGURE 6). The guide **39** is then raised to press the head **37** of the gripper member against the underside of the piece **33** so that the latter is firmly gripped between the removing and gripping members (FIGURE 7). Actually, the movements of the parts **30** and **39** may be simultaneous so that there is no intermediate position corresponding to FIGURE 6. Both the rigid support **30** and the guide **39** continue their upward movement as shown in FIGURE 8, so that the resilient support **36** is compressed by the upward movement of the sheet **32**. However, the piece **33** is prevented by the fixed removing member **35** from partaking of this movement, so that in effect the piece **33** is struck out from the rest of the sheet **32**. During this operation the piece **33** remains firmly gripped on both sides. Next, the guide **39** is lowered to release the gripping member and permit the piece **33** to fall away, as shown in FIGURE 9. Finally, the rigid support **30** is lowered again to the position shown in FIGURE 5. The expansion of the resilient support **36** strips the rest of the sheet **32** off the removing member **35**. Here again, the lowering of the guide **39** and of the rigid support may be simultaneous.

In the modification shown in FIGURE 11, the rigid support is in the form of a plurality of parallel bars **40** which support a sheet **41** from which a piece **42** is to be struck out. The bars **40** are aligned with the direction in which the sheet **41** is moved into and out of the device.

What I claim as my invention and desire to secure by Letters Patent is:

1. A device for removing at least one piece from punched sheet material which comprises a rigid support for supporting said sheet material, a removing member having a profile conforming to the shape of said piece and disposed on the side of said sheet material opposite to said rigid support, a resilient support for said sheet material disposed on the same side of said sheet material as said removing member, a gripping member disposed on the same side of said sheet material as said rigid support, means for effecting relative movement between said gripping member and said removing member for gripping and releasing said piece, means for effecting relative movement between, on the one hand, said gripping and removing members and said gripped piece, and on the other hand said rigid support and the rest of said sheet material for forcing said removing member together with said gripped piece through the rest of said sheet material, and independent means for effecting relative movement between said gripping and removing members

2. A device according to claim **1** in which said removing member is fixed and said rigid support is movable.

3. A device according to claim **1** including common mounting means for said resilient support and said removing member having a common mounting.

4. A device according to claim **1** in which said resilient support consists of sponge-like material.

5. A device according to claim **1** in which said rigid support comprises a plate having an opening therein substantially larger than said piece to be removed through said opening.

6. A device according to claim 1 in which said rigid support comprises a plurality of spaced bars.

7. A device according to claim 1 in which said removing memebr is made of wood.

8. A device for removing at least one piece from punched sheet material which comprises a rigid support for said sheet material, means for imparting up and down reciprocating motion to said rigid support, a fixed removing member having a profile conforming to the shape of said piece disposed on the side of said sheet material opposite to said rigid support, a resilient support made of sponge-like material disposed on the same side of said sheet material as said fixed removing member and surrounding said profile of said fixed removing member, a gripping member disposed on the same side of said sheet material as said rigid support, and means for imparting up and down reciprocating motion to said gripping member independently of said rigid support.

9. A method of removing at least one piece from already punched sheet material which comprises:

(a) clamping said sheet material between a resilient support member on one side thereof and a rigid support member on the other side thereof, such support members having apertures at least in the region of said piece;

(b) gripping said piece between a removing member disposed on the same side as said resilient support member and occupying said aperture in said resilient support member, and a gripping member on the same side as said rigid support member, the profile of said removing member conforming to the shape of said piece;

(c) effecting relative movement between, on the one hand said removing and gripping members and said gripped piece, and on the other hand said rigid support member and said clamped sheet material, to force said removing member together with said gripped piece through said clamped sheet material while compressing said resilient support member;

(b) separating said gripping member and said removing member to release said removed piece while the same is displaced from said clamped sheet material; and

(e) effecting opposite relative movement between, on the one hand said removing member, and on the other hand said rigid support member, to permit said resilient support member to expand and strip said sheet material from said removing member.

10. A method according to claim 9 in which said aperture in said resilient support member surrounds and contacts the whole profile of said removing member.

References Cited by the Examiner

UNITED STATES PATENTS

3,015,884	1/1962	Chamberlain	83—103 X
3,055,275	9/1962	Schroter	83—153 X
3,060,776	10/1962	Bobst et al.	83—103
3,064,511	11/1962	Allander	83—143 X
3,249,272	5/1966	Scarpa	225—103 X

FOREIGN PATENTS

867,634	5/1961	Great Britain.

WILLIAM W. DYER, JR., *Primary Examiner.*

J. M. MEISTER, *Assistant Examiner.*