(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 395 605 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90850121.6**

(51) Int. Cl.5: **B26D 7/18**

(22) Date of filing: **29.03.90**

(30) Priority: **30.03.89 SE 8901106**

(43) Date of publication of application:
31.10.90 Bulletin 90/44

(84) Designated Contracting States:
CH DE DK FR GB LI

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(54) Matrix.

(57) The invention is for a die for a cleaning tool for the removal of surplus pieces which are obtained when punching blanks from sheet material. The invention is primarily intended for use when punching cardboard sheet in the production of e.g. packages. In a first operation thereby the pieces are not completely punched out from the sheet but are still to some extent connected to each other and to those parts of the sheet which shall be removed to give holes of various kinds. The surplus pieces which are positioned between the blanks often have the shape of thin strips. Before the continuing handling of the punched blanks these surplus pieces shall be removed. According to the invention for this purpose is used a die having holes through which the surplus cardboard pieces shall pass. Parts of the hole through which a surplus piece shall pass is covered by tabs of flexible material which is present on the upper surface of the die board. There is also a corresponding upper die which has prutruding members preferably having the shape of pins or discs, by which means the punched parts are removed from the blank and pushed beyond the tabs through the hole. Thereby that the punched parts are clamped between the prutruding members of the upper die and the flexible tabs it is secured that the surplus pieces are entirely freed and removed from the blank.

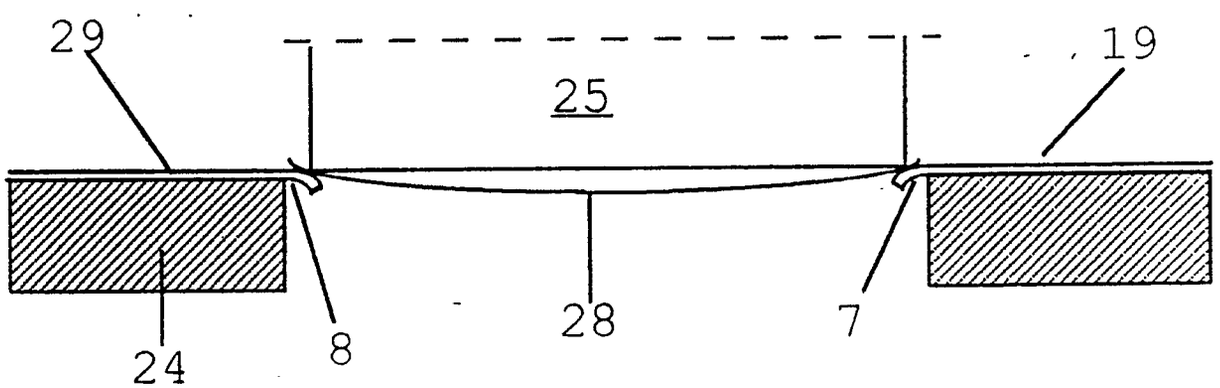

Fig. 5

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The present invention is for device by tools for the removal of surplus pieces of material which appear at punching of sheet material. Such materials are e.g. cardboard and rigid plastic foils, from which blanks for packages are punched. The invention is for a lower die for a tool for removal of surplus pieces which appear between adjacent punched blanks and along the outer edges of the sheet material which is being used. Blanks for packages of various kinds are punched by known methods from sheets of cardboard or other suitable material. The sheet material may be in the form of cut sheet or continuous sheet which is then often delivered for punching in large or small rolls. In order to facilitate the handling the blanks are not completely cut out at the punching but are still to some extent connected. At the punching surplus or waste pieces appear between the blanks and along the edges of the material which pieces are removed in a work operation which follows after the punching. It is hereby always aimed at having as little surplus as possible. This often means that the surplus pieces between the blanks have the shape of narrow strips. These surplus pieces must be removed before further handling of the punched blanks.

For the removal of surplus and waste pieces it is most convenient to use a device comprising a lower die which has holes, the shape and size of which correspond to those pieces which shall be removed and an upper die having protruding members being shaped as discs or pins. The protruding members are intended to push the surplus pieces through the holes in the lower die. The pressure which these members exercise on the surplus pieces is, however, often irregularly distributed over the surface of the pieces. Moreover, the force which is required along various parts of the edges of the pieces varies depending upon that the punching is always somewhat irregular. This brings about that the surplus pieces often do not get fully loose from the original sheet but remain hanging from some edge and thereby protrude from the sheet. This may bring about considerable problems at the further handling of the material thereby that the removal is incomplete and pieces of sheet hook up onto each other. In order to avoid these problems devices have been designed, whereby the surplus pieces are clamped between the protruding members of the upper die and corresponding pins or other members which are introduced from the opposite side of the lower die. The complete cleaning device then comprises a horizontal mounted lower die having a number of holes corresponding to the surplus pieces which shall be removed from the punched sheet, further an upper die having a horizontal mounted board with a number of downwardly protruding members in the shape of fingers or discs. Further there are to the protruding members of the upper die corresponding similar members which are mounted onto suitable holders and which protrude upwardly through the holes in the lower die to the protruding members of the upper die in such a way that the surplus from below and the protruding members of the upper die. In order to remove a surplus piece there are then required a number of operations, namely that protruding members are brought in from below through the holes of the lower die, that the upper die is lowered so that the surplus pieces are clamped, that the upper die and the from below protruding members at the same time are brought downwards and thereby take along the surplus pieces through the holes of the lower die, that the protruding members of the upper die and from below protruding members are brought apart from each other so that the surplus pieces are free and finally that the upper die again is brought up so that its protruding members are in a position above the lower die so that another punched sheet can be brought in over the lower die.

The object of the present invention is to eliminate the draw-backs connected to the above described devices for cleaning of punched sheet material. With a device according to the invention it is thus possible to remove the surplus pieces without risking that they remain hanging along an edge and thereby cause problems in the further handling of the goods. By the invention it is also possible to eliminate complicated arrangements and a number of process steps to keep the surplus pieces in position during the removal. This is obtained by designing the lower die with those characteristic features which are mentioned in the characterizing part of claim 1.

The invention is below described and illustrated by the enclosed Figures.

Fig. 1 is an example of a lower die according to the invention.

Fig. 2 is an upper die corresponding to the lower die shown in Fig. 1.

Fig. 3 is cross section along the line A-A of the lower die in Fig. 1.

Fig. 4 is a cross section along the line B-B of the upper die in Fig. 2.

Figures 5 and 6 show in principle a cross section along the line C-C of the lower die of Fig. 1 during an operating cycle, whereby the upper die is brought so far towards the surplus piece which is to be removed that this has begun to loosen from the sheet. In the Figure there are also shown parts of the protruding members of the upper die.

The lower die according to the invention shown in Figure 1 comprises a board 1. In the board there are a number of holes 3, 4, 5, 6, the shape of which correspond to the surplus pieces which are

to be removed from the punched sheets. On the upper side of the lower die there are at each hole two taps 7 - 14. The board shown in the Figure also has four holes 15, 16, 17, 18, which are intended for the mounting and controlling of the lower die. These holes may of course vary both in number and position depending on the intended application.

Figure 2 shows an upper die corresponding to the lower die of Figure 1. This upper die comprises a board 2, having a number of protruding members, in this case thin discs 20, 21, 22 and 23. The shape of the discs in principle corresponds to the hole of the lower die but having somewhat smaller length and being much thinner.

As can be seen in Figure 3, the board of the lower die 1 comprises a thick board 24, which is covered by a thin board 19, from which tabs 7, 9 and 11 have been made to project over the holes 3, 4 and 5. In the same way Figure 4 is a cross section through the upper die of Figure 2, in which can be seen the discs 20, 21 and 22 corresponding to the holes.

In Figures 5 and 6 are shown in principle the operation of a die according to the invention. The Figures show a cross section along the line C-C in Figure 1 of the bottom board 24 of the lower die and the thin board 19 on top thereof, wherein tabs 7 and 8 have been made. On the lower die there is a sheet 29, from which a surplus piece 28 shall be removed. This is obtained thereby that the disc 25 shown in the Figure 5 which is attached to one in the Figure not shown upper die is brought downwards. Hereby the surplus piece 28 is clamped between the tabs 7 and 8 and the disc 25. When the disc continues to move downwards the tabs 7 and 8 and the outer edges of the surplus piece 28 are bent. The downward movement of the disc continues so far that the surplus piece is brought entirely beyond the tabs 7 and 8. Thereby that the surplus piece in this way in the beginning of its downward movement is clamped between the tabs and the disc it is ensured that the surplus piece will be loosened along its entire circumference from the sheet material. In Figure 6 there is shown an alternative mode of the invention, whereby the disc 25 mounted on to the upper die has been substituted for two pins 26 and 27. The function is otherwise the same as described above.

It has been found suitable that the length of the discs which are mounted on to the upper die is such that when the discs are brought down into the corresponding empty holes they will just pass without touching the tabs, i.e. the length of the disc is just a little less than the length of the free opening in the hole. The maximum bending of the tabs during the cleaning operation is then about 30° and a very safe and reliable function of the cleaning device is obtained.

The tabs can be made from various materials which has been chosen for each application. When punching of cardboard for small packages it has for example turned out to be suitable to choose tabs made from rigid plastic foil which is some tenth of a millimetre thick. The tabs have been described above as being part of a top layer of the lower die but they may of course be small pieces which are attached to the upper surface of the lower die. The tabs may also be made of other material than plastic. The lower die may be made from for example a 10 to 25 mm thick wooden board, the length and width of which is often in the interval 200 to 900 mm. Within the scope of the invention also the length of the tabs can vary within wide limits.

Claims

1) Die for a cleaning tool for the removal of surplus pieces by punching of blanks from sheet material e.g. cardboard. whereby the die especially has the shape of a board, intended to be positioned horizontally and having holes, through which the surplus cardboard pieces shall pass, **characterized therein**, that parts of at least one of the holes are covered by tabs of flexible material and positioned on the upper surface of the board of the die.

2) Die according to claim 1, **characterized therein**, that its upper surface is coated by a sheet from which the tabs have been formed.

3) Die according to claim 1, **characterized therein**, that the coating sheet is a plastic sheet.

4) Die according to any of the preceding claims, **characterized therein**, that the size and shape of the holes correspond to the surplus pieces.

5) Die according to any of the preceding claims, **characterized therein**, that at each hole there are at least two opposite each other positioned flexible tabs.

6) Die according to claim 5, **characterized therein**, that at holes with a large length to width relation tabs are positioned at the short sides.

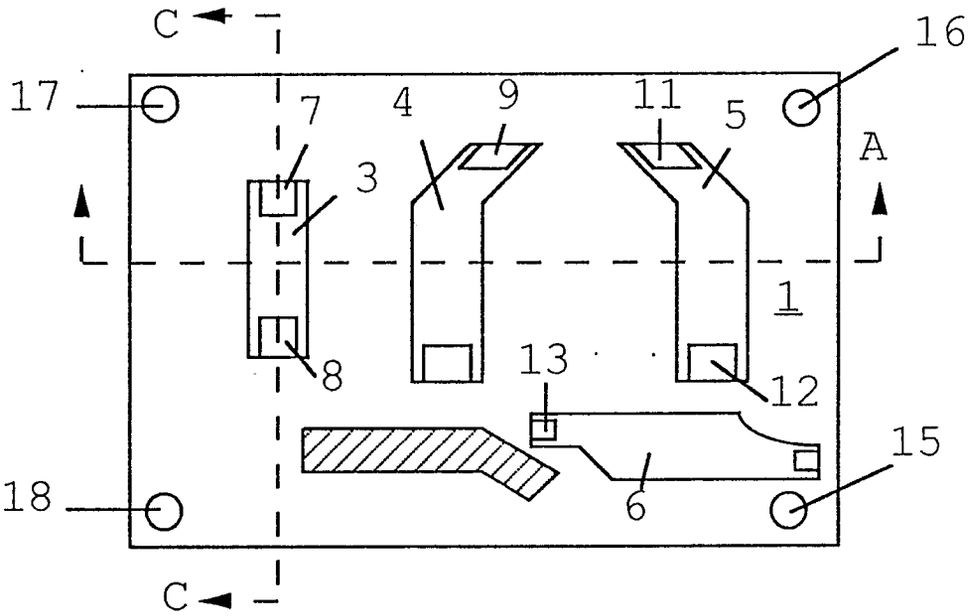

Fig. 1

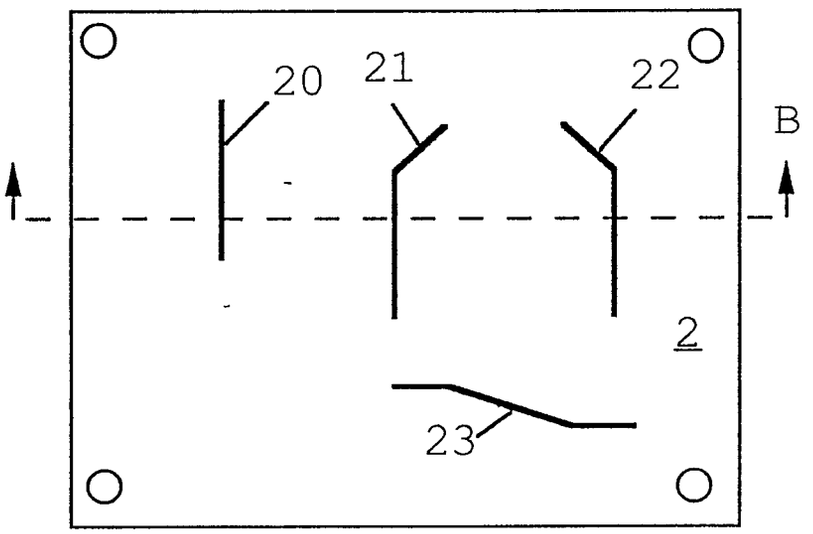

Fig. 2

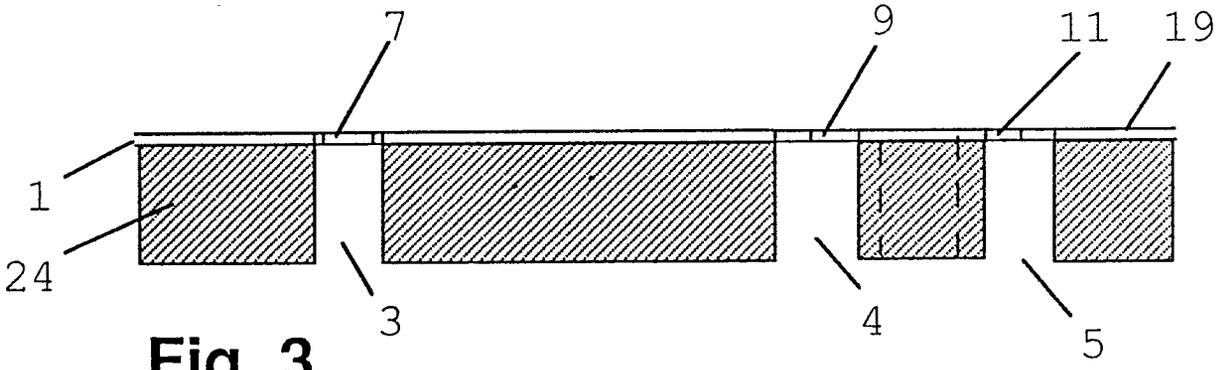

Fig. 3

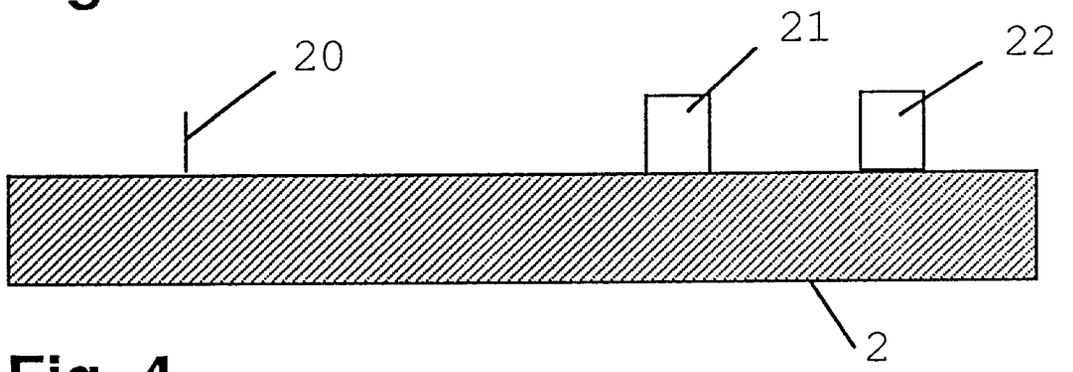

Fig. 4

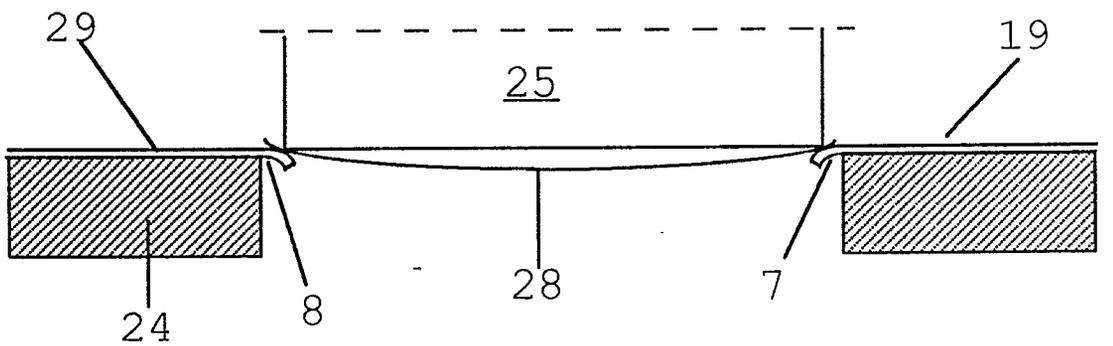

Fig. 5

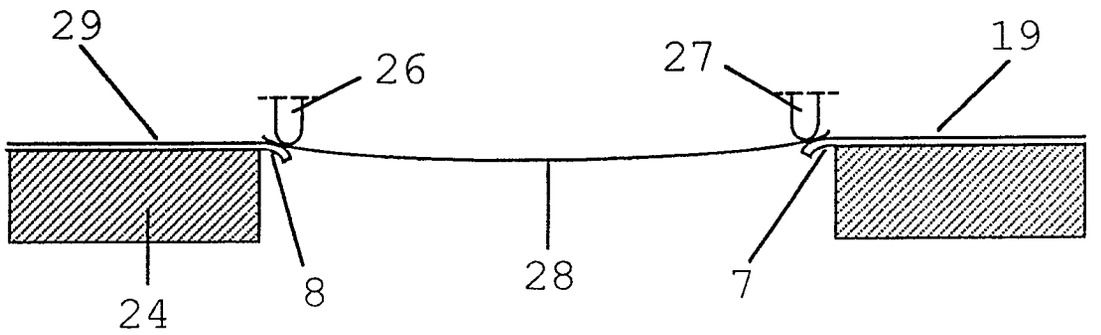

Fig. 6