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MOVABLE UPPER TOOL FOR THE SEPARATION OF THE BLANKS FROM A SHEET WHICH IS PROCESSED BY A PRESS THAT MANUFACTURES PACKAGES

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(56) Prior Art Documents
GB 606747
EP 0323097
US 529047

(57) Claim

1. A movable upper tool for separation of blanks from a sheet being processed by a package-manufacturing press, inter alia a press for manufacturing packages from corrugated cardboard, the tool comprising a baseplate having openings and with punches secured to its lower surface , the tool co-operating with a lower tool for separating the blanks , characterised in that the openings are disposed along two orthogonal axes one axis being a straight line inclined relative to one edge of the baseplate of the movable upper tool , and at least one side of the cross-section of the punches is at a tangent to one opening , so that the space between the punches is such that they exert a uniform total pressure on the blank for separation, near the separating bar of the lower tool for separation of blanks , irrespective of the position occupied by the separating bars on the lower tool.

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BOBST S.A.

ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title:

"Movable upper tool for the separation of the blanks from a sheet which is processed by a press that manufactures packages"

The following statement is a full description of this invention including the best method of performing it known to us:-

The invention relates to a movable upper tool for separation of blanks from a sheet being processed by a package-manufacturing press, inter alia a press for manufacturing packages from corrugated cardboard.

A press for manufacturing corrugated cardboard packages usually comprises a number of successive stations in the following order:

- a feed station,
- a cutting station,
- a waste ejection station and
- a station for separation and delivery of the blanks.

In a machine of this kind, corrugated cardboard sheets from the feed station are inserted into the grippers of a conveying device comprising gripper bars fitted at their ends on to two sets of chains disposed opposite one another in each side frame of the machine. The corrugated cardboard sheets held in the gripper-bar grippers are then conveyed successively through each of the aforementioned stations. At a first stop, the sheets are cut by the cutting station into blanks interconnected by bridges and then, at a second stop, the waste between or in the blanks is eliminated from

the sheet and in a third stop the blanks are separated from one another and stacked in the separation and delivery station.

After the waste has been removed in the ejection station, the corrugated cardboard sheet is brought to the blank separation and delivery station, where the blanks are separated from one another by using the same movement as used in the waste ejection station. In a blank separation station it is known to use a movable upper tool and a fixed lower tool. The upper tool comprises a set of punches and the lower tool is a die with openings. The movable upper punches force the blanks through the openings in the lower die, breaking the various bridges connecting each blank to the others or connecting the marginal blanks to the waste around the sheet. The separating tools must therefore be adapted to the shape and arrangement of the blanks in each new set of sheets for processing.

Usually the blanks are aligned, relative to the cutting lines of the press, on a baseplate secured to an upper movable tool-bearing frame on the blank separation station. A corresponding opening or mesh on the bottom die, made up of bars, is disposed below and opposite each punch. The bars are arranged in overlapping manner to form a grid or array having meshes approximately the same size as the blanks to be separated.

To avoid the need to manufacture new blank-separating tools for each new set of sheets, it has been proposed in patent CH-A-617 886 to fit the punches so as to be

horizontally movable along fixed bars on a vertically movable frame, each punch being in the form of a block connected to its neighbour by means fitting into one another. The fixed bottom die is made up of intersecting bars which are movable so as to form a grid with meshes of adjustable dimensions.

Another method of constructing the movable upper tool is to use a plate formed with through bushes for engaging self-locking pins for securing punches adapted to push the blanks for separation through corresponding openings in a lower tool. This solution is described in detail in patent CH-681 874.

Another method of constructing the movable upper tool is to use a plate formed with a large number of openings, rigid blank-separating punches being mounted on the underside of the plate and fixed thereto by self-sticking strips as disclosed in patent CH-682 651.

As mentioned in the previously-cited patents, the movable upper tools have to be constructed, e.g. by forming a number of openings in the plate constituting them, so that air can flow through them when the tool moves vertically.

In this method, of course, it is necessary to construct a new tool specifically for each configuration of waste on the sheet. Apart from the cost and time for constructing this new tool, it will be necessary to provide a large area for storing the various tools used, since the jobs carried out on the machine are

frequently repetitive, requiring re-use of already-manufactured tools.

Accordingly, the previously-described blank-separating tools all have the disadvantage of requiring relatively long preparation, depending on each different job to be performed by the machine. When a number of different jobs have to be performed during the same working day, these operations reduce the efficiency of the machine by increasing the idle time during which the machine is not operational. The problem is therefore to increase the effective production capacity of the package-manufacturing machine.

The aim of the invention is to obviate the aforementioned disadvantages inherent in existing blank-separating tools. This object is achieved by means of an upper blank-separating tool according to claim 1.

An embodiment of an upper blank-separating tool is described hereinafter by way of example with reference to the accompanying drawings in which:

Fig. 1 is a plan view of a first version of an upper tool;

Fig. 2 is a plan view of a second version of an upper tool;

Fig. 3 is a plan view of a lower tool for separation of blanks;

Fig. 4 is a sectional view of a punch during the step of separating a blank and

Fig. 5 is a sectional view along V-V in Fig. 2.

Fig. 1 is a plan view of a first version of an upper tool 1 for separating box blanks 2, which are chain-dotted in the drawing. The upper tool 1 comprises a baseplate 3, usually of wood or synthetic material, and cuboidal punches 4 stuck to the bottom surface of the baseplate 3. The baseplate has openings 5 which are circular in the present embodiment. These openings extend through the baseplate 3 and are adapted to provide a passage for air when the upper tool 1 moves vertically in reciprocation. The openings could be of any shape, e.g. square. The circular shape was chosen for ease of machining.

The openings 5 are disposed in the baseplate 3 along two orthogonal axes 6 and 7, the axis 6 being a straight line sloping at an angle 8 of between 15 and 20° relative to one edge of the baseplate 3. The edge chosen in the present case is that at the top of the drawing, and can be regarded as the front edge of the baseplate 3. The exact value of angle 8 is determined by the size of the openings 5, the size of the punches 4, and the space between the punches 4, so that the punches exert a uniform pressure on the blank 2 to be separated, near the longitudinal and transverse separating bars 9, 9a on the lower tool 10 (see Fig. 3). The punches 4 are square in cross-section and are preferably made of foam rubber of density between 30 and 100 kilograms per cubic metre. The density chosen

in the present example, during practical tests, was 80 kilograms per cubic metre. The density of the foam rubber is chosen in dependence on the characteristics of the processed corrugated cardboard. In the example illustrated here, the punches 4 are disposed on the baseplate 3 so that each of the four sides 11 of their square cross-section is at a tangent to the openings 5. As a result of this arrangement of the various punches 4 on the baseplate 3, the total pressure of the punches near the longitudinal and transverse separation bars 9, 9a on the lower tool 10 will be uniform irrespective of the position of the separating bars 9, 9a. In the embodiment shown in Fig. 1, some punches 4 opposite the separating bars 9, 9a on the lower tool 10 will be somewhat deformed, which may interfere with the efficient operation of the upper tool 1. This disadvantage can be obviated simply by forming a notch, e.g. with a knife, in the punches 4 opposite each longitudinal and transverse separation bar 9, 9a on the lower tool 10.

Fig. 2 is a plan view of a second version of an upper tool 1 in which the arrangement of punches 4 is similar to that shown in Fig. 1. Since, however, the longitudinal separation bar 9 occupies the same position along the axis of the upper tool 1, it may not be necessary to notch the punches 4 near the longitudinal separation bar 9. To this end, the upper tool 1 is divided into two areas 12 and 13 comprising punches 4 disposed in the same manner as on the upper tool 1 in Fig. 1, the two areas 12 and 13 being separated by a number of punches 4a disposed so that some of their sides are at a tangent and diagonal

relative to the circumference of the circular openings 14 aligned with the central axis of the upper tool 1. This arrangement conforms to the condition of uniform pressure on the blanks 2 near the longitudinal separation bar 9, but avoids one of the operations of notching the punches 4. A similar arrangement of punches 4a could be used near the central transverse separation bar 9a, provided that the transverse separation line of the blanks 2 is still centred on the central transverse separation bar 9a.

Fig. 3 is a plan view of a lower tool 10 for separation of blanks 2. Four blanks 2 are shown in the drawing. The blanks 2 are interconnected by bridges 19. The bottom tool 10 comprises a frame having two transverse longitudinal members 15, 16 and two longitudinal cross-members 17 and 18. The longitudinal separation bars 9 are disposed between the transverse members 15, 16 and secured thereto via stirrups 20 which are adapted to be moved and locked in position along the transverse members 15 and 16. The transverse separation bars 9a are fitted between the longitudinal cross-members 17, 18 and secured thereto by stirrups 21 similar to stirrups 20 and adapted to be moved and locked in position along the longitudinal cross-members 17 and 18. The upper tool 1 is disposed above the lower tool 10 and, during its descent, pushes the various blanks 2 through the meshes formed by the longitudinal and transverse bars 9 and 9a. The bridges 19 will then be broken, thus separating the blanks 2 from one another.

Fig. 4 is a sectional view of a set of punches 4 during the step of separating a blank 2. Fig. 4 shows the

tool 1 in Fig. 1. As can be seen in Fig. 4, the punches 4 are deformed by the pressure resulting from the downward movement of the upper tool 1. The punches 4 are made of deformable material and consequently even if they meet a solid object such as a separating bar 9, separation will be efficiently brought about. A non-separated sheet 21, represented by chain lines, has a front part or "gripper grip" 22 which is gripped by the grippers 23 and is used to convey the non-separated sheet 21 to the station for separation and delivery of blanks 2. The grip 22 will of course be subsequently removed during the next advance of the machine.

Fig. 5 is a view in section along V-V in Fig. 2, showing how each punch 4a 4 is secured to the underface 24 of the baseplate 3 of the upper tool 1. The punches 4, 4a are generally secured by sticking, but a different method of permanent securing could be used. In the present example, the punches 4, 4a are square-section prisms, but a different e.g. polygonal or circular section could quite well be chosen, depending on the practical results obtained in production tests.

As the description shows, the advantage of using an upper tool 1 as proposed by the invention is that a single tool can be used to separate different-sized blanks without lengthy tedious adjustment as in the case of conventional separating tools used hitherto. This greatly reduces the time for starting a new job and correspondingly increases the production capacity of the package-manufacturing machine.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A movable upper tool for separation of blanks from a sheet being processed by a package-manufacturing press, inter alia a press for manufacturing packages from corrugated cardboard, the tool comprising a baseplate having openings and with punches secured to its lower surface, the tool co-operating with a lower tool for separating the blanks, characterised in that the openings are disposed along two orthogonal axes one axis being a straight line inclined relative to one edge of the baseplate of the movable upper tool, and at least one side of the cross-section of the punches is at a tangent to one opening, so that the space between the punches is such that they exert a uniform total pressure on the blank for separation, near the separating bar of the lower tool for separation of blanks, irrespective of the position occupied by the separating bars on the lower tool.

2. A movable upper tool according to claim 1, characterised in that it is divided into two areas formed with openings disposed along two orthogonal axes, one axis being a straight line inclined relative to one edge of the baseplate of the movable upper tool, at least one side of the cross-section of the punches being at a tangent to one opening, and the two areas are separated by an area comprising punches disposed tangentially and diagonally

relative to openings aligned along the central axis of the movable upper tool .

3. A movable upper tool according to claim 1, characterised in that the slope of the line constituting the orthogonal axis is at an angle between 15 and 20° to one edge of the baseplate of the movable upper tool .

4. A movable upper tool according to claim 1, characterised in that the punches are cuboidal.

5. A movable upper tool according to claim 4, characterised in that the punches are of foam rubber of density between 30 and 100 kilograms per cubic metre.

DATED THIS 10 day of July 1995

BOBST S.A.

Patent Attorneys for the

Applicant:-

F B RICE & CO

A B S T R A C T

The movable upper tool for separation of blanks comprises a baseplate (3) formed with openings (5), punches (4, 4a) being secured to the underface (24) of the baseplate. The tool co-operates with a lower blank-separating tool (2). The openings (5) are disposed along two orthogonal axes (6, 7). One axis (6, 7) is a straight line which slopes relative to one edge of the baseplate (3) of the movable upper tool (1). At least one side (11) of the cross-section of the punches (4, 4a) is at a tangent to one of the openings (5), so that the spacing between the punches (4, 4a) is such that the total pressure of the punches on the blank (2) for separating is uniform in the neighbourhood of a separating bar on the lower blank-separating tool, irrespective of the position occupied by the separating bars on the lower tool.

(Fig. 1)

Fig. 1

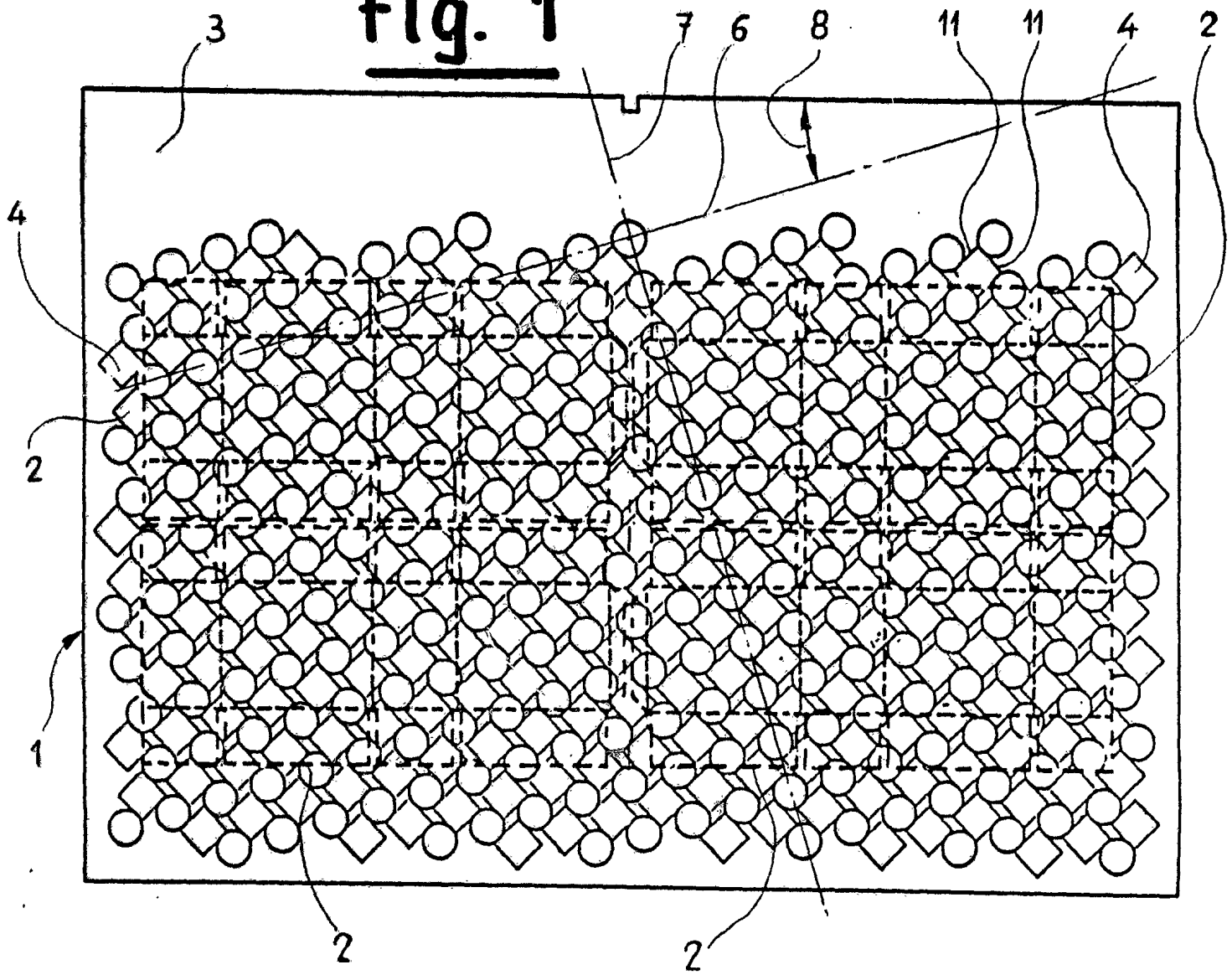

Fig. 2

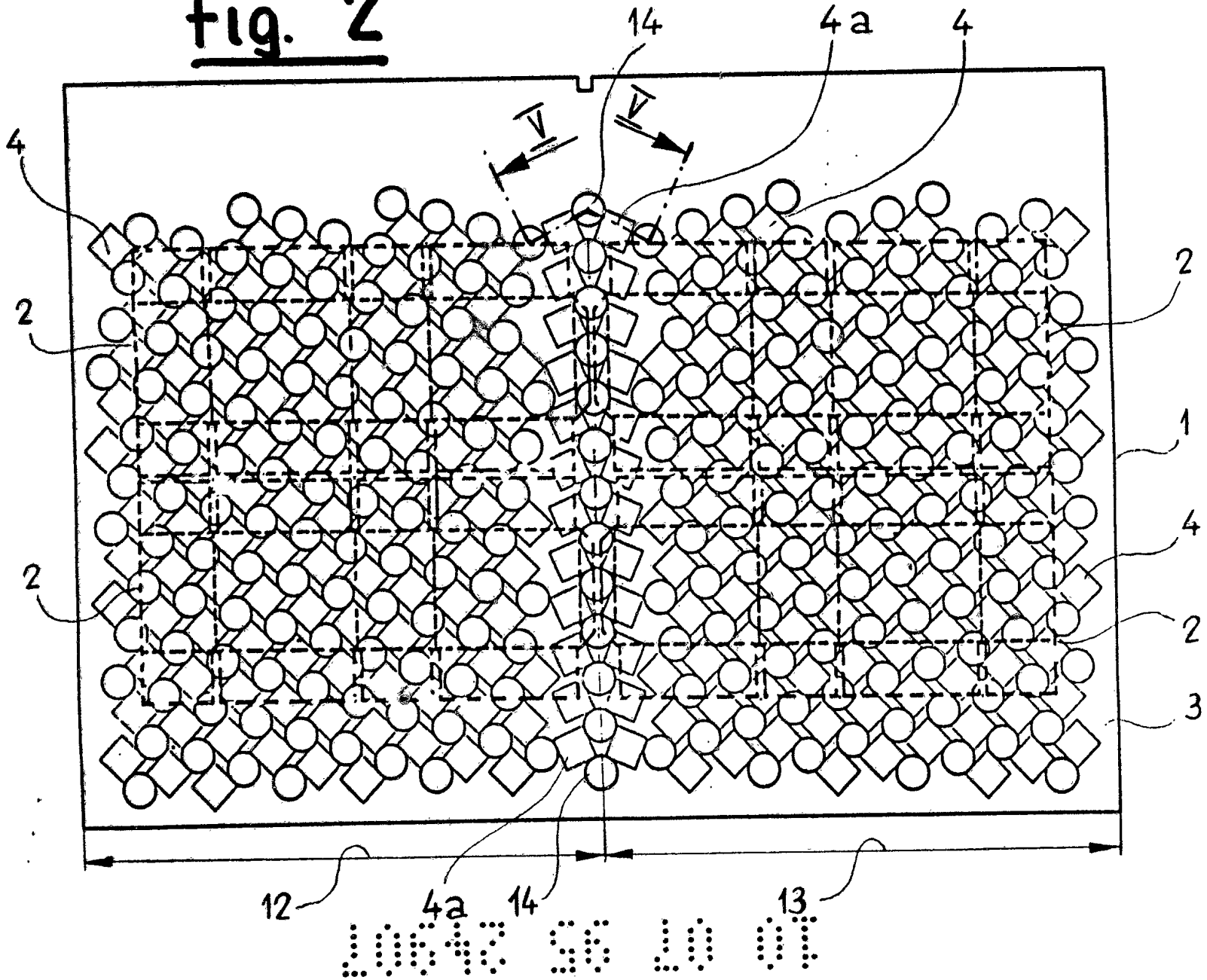

Fig. 3

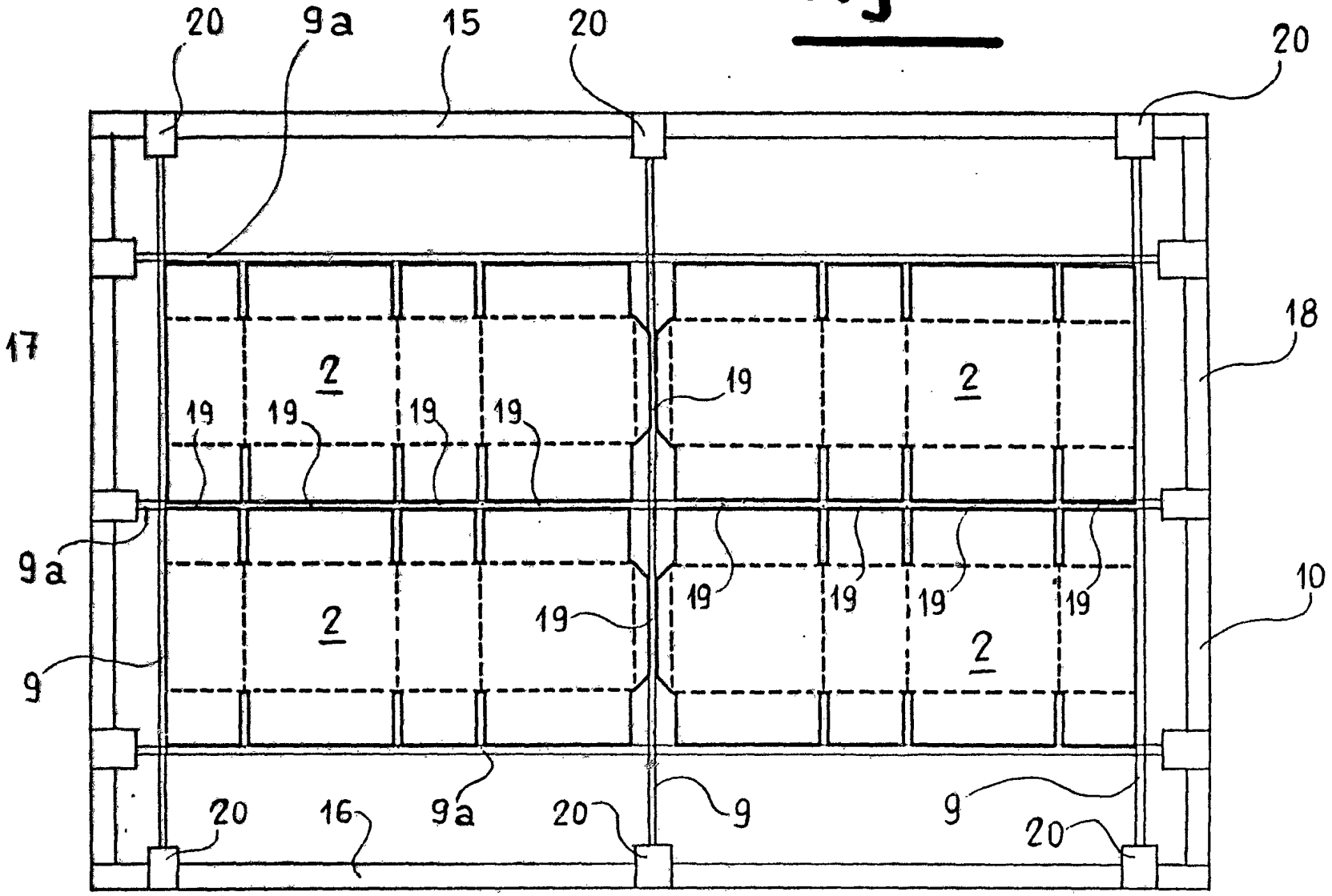
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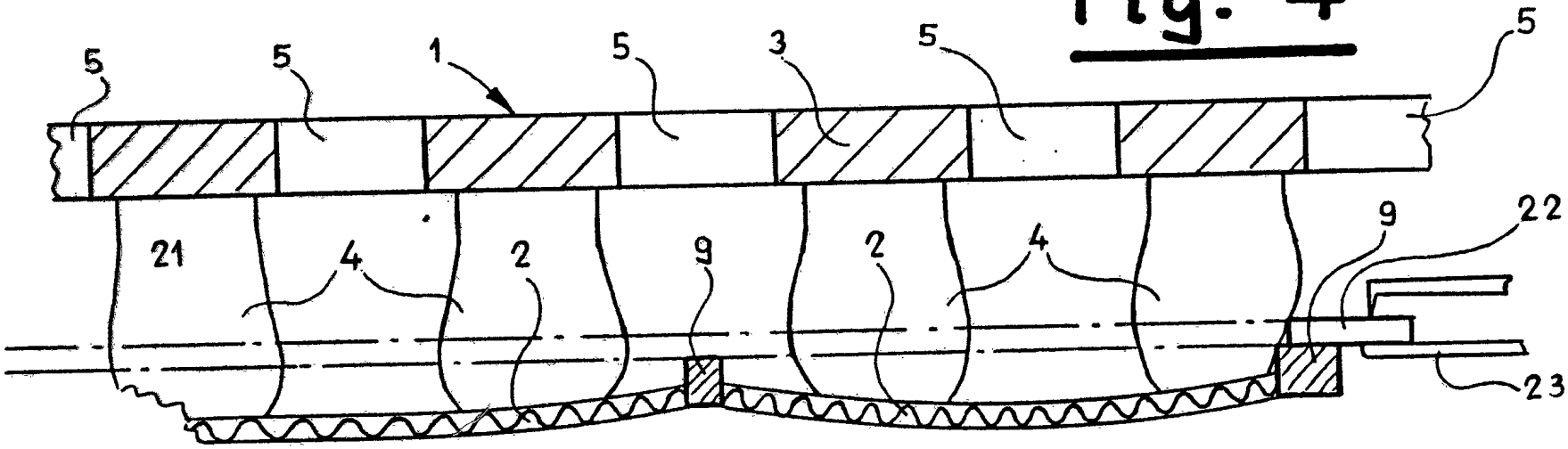
Fig. 4



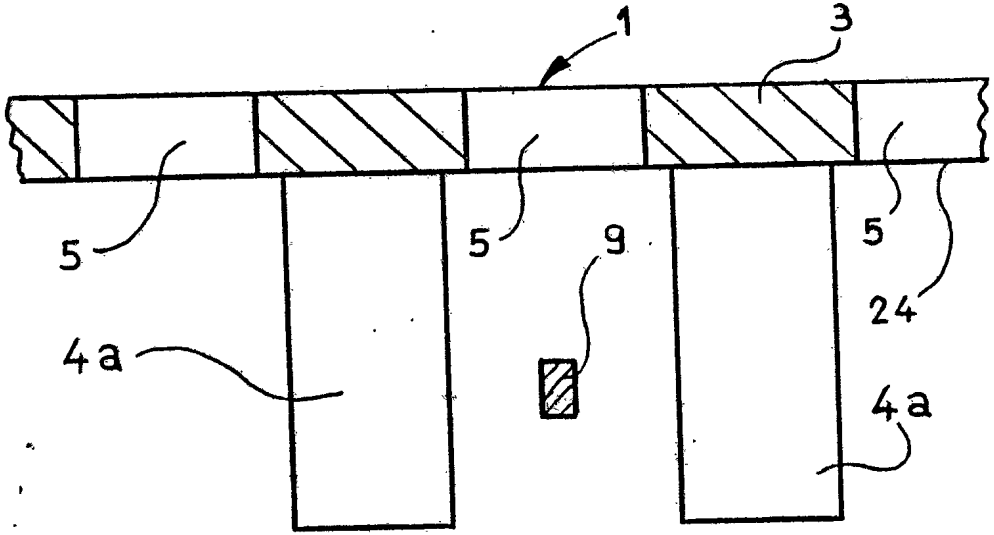


Fig. 5