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54 **Device for producing a fold-up sheet.**

57 The invention relates to a device for producing a fold-up sheet, such as e.g. a map or a plan, said sheet being provided with a number of zigzag-shaped folding lines extending parallel to each other, and with further folding lines extending parallel to each other, and transversely to said zigzag-shaped folding lines, whereby said further folding lines extend through the corner points in which each time two adjacent parts of the zigzag-shaped folding lines join each other. The device comprises a forming block (6) having a boundary plane built up of forming surfaces (9), which slope downwards from a number of zigzag-shaped boundary lines (8) extending parallel to each other and being located in one plane, and which intersect each other according to a number of further lines (10), which are located in a second plane extending parallel to the first plane and which extend zigzag-shaped and parallel to the former zigzag-shaped lines (8), and according to lines (11) extending between the corner points where the parts of the zigzag-shaped lines (8, 10) including an angle with each other intersect. Further there are provided a number of stamps (12, 18), which are movable up and down relative to the forming block,

whereby the side of each stamp (12, 18) facing the forming block is designed such that said side fits on a forming surface (9) sloping downwards from a zigzag-shaped boundary line (8) at one side of said boundary line.

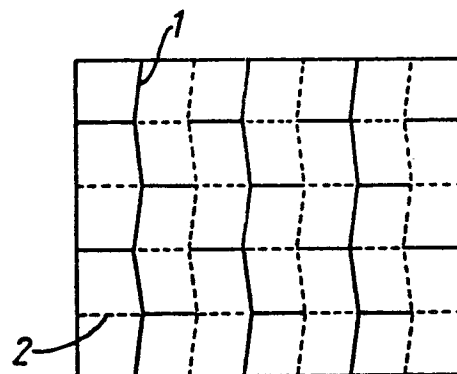


FIG. 1.

Device for producing a fold-up sheet

The invention relates to a device for producing a fold-up sheet, such as e.g. a map or a plan, said sheet being provided with a number of zigzag-shaped folding lines extending parallel to each other, whereby the sheet parts bounding a folding line can be folded relative to each other about a folding line, in a direction opposite to the direction in which sheet parts bounding an adjacent folding line can be folded relative to said adjacent folding line, and with further folding lines extending parallel to each other, transversely to the zigzag-shaped folding lines, said further folding lines extending through the corner points in which each time two adjacent parts of the zigzag-shaped folding lines join each other, whereby the sheet parts which are located on both sides of a first part of a further folding line, which first part extends between two adjacent zigzag-shaped folding lines, can be folded relative to each other about said first part of the further folding line, in a direction opposite to the direction in which the sheet parts, which are located on both sides of a further part of the further folding line joining said first part of the further folding line, can be folded about said further part of the further folding line.

Such a map and a device for producing such a map are known from the Japanese publication No. 151460, which was deposited for public inspection in 1980. The device disclosed in said publication comprises two opposed endless bands, each carrying a number of blocks. The blocks of the two bands are made such that the blocks mounted on opposed parts of the two bands engage each other. A sheet to be folded must be passed between the bands in order to be folded by the engaging blocks.

Said device has a complicated construction and in practice it has become apparent that it is not possible to fold a sheet correctly and accurately by means of said device.

The object of the present invention is to obtain a device of the above kind, by means of which a sheet can be efficiently and effectively folded in the desired manner.

According to the invention this objective can be accomplished in that the device comprises a forming block having a boundary plane built up of forming surfaces, which slope downwards from a number of zigzag-shaped boundary lines extending parallel to each other and being located in one plane, and which intersect each other according to a number of further lines, which are located in a second plane extending parallel to the first plane and which extend zigzag-shaped and parallel to the former zigzag-shaped lines, and according to lines

extending between the corner points where the parts of the zigzag-shaped lines including an angle with each other intersect, whilst there are provided a number of stamps, which are movable up and down relative to the forming block, whereby the side of each stamp facing the forming block is designed such that said side fits on a forming surface sloping downwards from a zigzag-shaped boundary line at one side of said boundary line.

The invention will be further explained with reference to the accompanying figures.

Fig 1 is a plan view of a sheet provided with folding lines, which can be produced by means of a device according to the invention.

Fig 2 is a larger-scale, diagrammatic side elevational view of a device according to the invention.

Fig 3 is an elevational view of a forming block forming part of the device of Fig 2, seen along the line III - III in Fig 2.

The sheet illustrated in Fig 1, which e.g. constitutes a map, a plan or the like, is provided with a number of zigzag-shaped folding lines 1 extending parallel to each other, said folding lines alternately being shown as full lines and dotted lines. Starting from the flat position of the sheet the parts of the sheet located on both sides of a full folding line can be folded in one direction relative to said folding line, such that the sides of said parts of the sheet located at the bottom side of the sheet, seen in fig. 1, will come to lie against each other. On the other hand the parts of the sheet located on both sides of a dotted folding line can be folded with respect to each other from the flat position of the sheet in an opposite direction, i.e. such that the upper sides the sheet parts bounding the dotted folding line, seen in Fig 1, will come to lie against each other when the sheet is being folded.

As furthermore appears from Fig 1 there are provided further folding lines 2 in the sheet, said folding lines extending transverse to the folding lines 1, between the corner points in which the parts of the folding lines 1 including an angle with each other join each other. As is illustrated in the Figure such a folding line 2 is built up of parts extending between the folding lines 1 and the edges of the sheet, respectively, said parts alternately being indicated by means of dotted lines and full lines. The sheet parts located on both sides of a dotted part of a folding line 2 can again be pivoted relative to each other about the folding line 2, such that the upper sides of the sheet parts in question, seen in Fig 1, will come to lie against each other when the sheet is being folded. On the other hand the sheet parts located on both sides of

a full part of a folding line 2 will come to lie against each other with their lower sides, seen in Fig 1, when the sheet is being folded.

As already mentioned before such a sheet is known from the Japanese patent application No. 53364 of 1979.

For providing the above-described folding lines 1 and 2 in a basic sheet use can be made of a device according to the invention, as is illustrated in Figs 2 and 3.

The device comprises a frame 3 provided with a table 4 which is vertically adjustable by means of a driving mechanism 5. A forming block 6 is supported on the table. Said forming block 6 is provided with a few ribs 7 having a triangular cross-section, which are arranged side by side and which extend perpendicularly to the plane of the drawing, seen in Fig 2, said ribs being bounded at their upper sides by a number of zigzag-shaped boundary lines 8 which are located in a horizontal plane. Forming surfaces 9 slope downwards from said zigzag-shaped boundary lines 8, in the direction of further zigzag-shaped boundary lines 10 which are located also in a horizontal plane. Each forming surface 9 is furthermore bounded by two boundary lines 11, which extend between the corner points where the parts of the zigzag-shaped lines 8 and 10 including an angle with each other intersect.

Above the forming block 6 there are arranged seven stamps 12 - 18, which are each connected, by means of a vertically extending connecting rod 19, with a driving mechanism 20, by means of which the stamps 12 - 18 can be moved up and down independently.

Measured in a direction perpendicular to the plane of the drawing in Fig 2 the length of each stamp 12 - 18 is equal to the length of the forming block 6, measured in a direction perpendicular to the plane of the drawing in Fig 2. The boundary side of each stamp 12 - 18 thereby furthermore corresponds with the design and arrangement of the forming surfaces 9 located thereunder, so that each 12 - 18 can be brought into close abutment with the row of forming surfaces 9 located thereunder and extending perpendicularly to the plane of the drawing in Fig 2.

After the table 4, with the forming block 6 supported thereon, has been brought to its desired height, a sheet to be folded can be put on top of the forming block 6 by means of a supply device (not shown), such that said sheet rests on the zigzag-shaped boundary edges 8. The stamps 12 - 18 are adjusted such that the lowermost points of said stamps 12 - 18 at least substantially rest on said sheet, so that the sheet cannot make any undesired upward movements.

Then the stamps 12 - 18 are moved downwards one by one, until they abut the forming

surfaces 9 of the forming block 6 located thereunder, starting with the stamp 12. The stamp 12 is moved downwards first, therefore, in order to press the left-hand end, seen in Fig 2, of the sheet resting on the forming block 6 against the most left-hand row, seen in Fig 2, of forming surfaces 9 located behind each other, by means of the stamp 12. Then the stamp 13 is moved downwards in order to press a following part of the sheet against the following row of forming surfaces 9, etc.

In practice it has become apparent that thus the desired folding lines can be provided in the sheet in an effective manner. After all stamps have been pressed downwards the stamps 12 - 18 and the forming block 6 can be moved again in a direction remote from each other, after which the pre-folded sheet can be removed.

Claims

1. A device for producing a fold-up sheet, such as e.g. a map or a plan, said sheet being provided with a number of zigzag-shaped folding lines extending parallel to each other, whereby the sheet parts bounding a folding line can be folded relative to each other about a folding line, in a direction opposite to the direction in which sheet parts bounding an adjacent folding line can be folded relative to said adjacent folding line, and with further folding lines extending parallel to each other, transversely to the zigzag-shaped folding lines, said further folding lines extending through the corner points in which each time two adjacent parts of the zigzag-shaped folding lines join each other, whereby the sheet parts which are located on both sides of a first part of a further folding line, which first part extends between two adjacent zigzag-shaped folding lines, can be folded relative to each other about said first part of the further folding line, in a direction opposite to the direction in which the sheet parts, which are located on both sides of a further part of the further folding line joining said first part of the further folding line, can be folded about said further part of the further folding line, characterized in that the device comprises a forming block (6) having a boundary plane built up of forming surfaces (9), which slope downwards from a number of zigzag-shaped boundary lines (8) extending parallel to each other and being located in one plane, and which intersect each other according to a number of further lines (10), which are located in a second plane extending parallel to the first plane and which extend zigzag-shaped and parallel to the former zigzag-shaped lines (8), and according to lines (11) extending between the corner points where the parts of the zigzag-shaped lines (8,10) including an angle with each other

intersect, whilst there are provided a number of stamps (12, 18), which are movable up and down relative to the forming block, whereby the side of each stamp (12, 18) facing the forming block is designed such that said side fits on a forming surface (9) sloping downwards from a zigzag-shaped boundary line (8) at one side of said boundary line.

other end of said forming block.

2. A device according to claim 1, characterized in that the stamps can be moved up and down independently.

3. A device according to claim 1 or 2, characterized in that the forming block is supported by a vertically adjustable table.

4. A method for producing a fold-up sheet, such as e.g. a map or a plan, said sheet being provided with a number of zigzag-shaped folding lines extending parallel to each other, whereby the sheet parts bounding a folding line can be folded relative to each other about said folding line, in a direction opposite to the direction in which sheet parts bounding an adjacent folding line can be folded relative to said adjacent folding line, and with further folding lines extending parallel to each other, transversely to the zigzag-shaped folding lines, which extend through the corner points in which each time two adjacent parts of the zigzag-shaped folding lines join each other, whereby the sheet parts which are located on both sides of a first part of a further folding line, which first part extends between two adjacent zigzag-shaped folding lines, can be folded relative to each other about said first part of the further folding line, in a direction opposite to the direction in which the sheet parts, which are located on both of a further part of the further folding line joining said first part of the further folding line, can be folded about said further part of the further folding line, characterized in that use is made of a forming block (6) having a boundary plane built up of forming surfaces (9), which slope downwards from a number of zigzag-shaped boundary lines (8) extending parallel to each other and being located in one plane, and which intersect each other according to a number of further lines (10), which are located in a second plane extending parallel to the first plane and which extend zigzag-shaped and parallel to the former zigzag-shaped lines (8), and according to lines (11) extending between the corner points where the parts of the zigzag-shaped lines (8, 10) including an angle with each other intersect, and the sheet is first pressed against the forming surfaces (9) located near one end of the forming block and sloping downwards from a zigzag-shaped boundary line (8) on one side of said boundary line, and then against the forming surfaces (9) extending downwards on the other side of said zigzag-shaped boundary line (8), and thus continuing in steps in the direction of the

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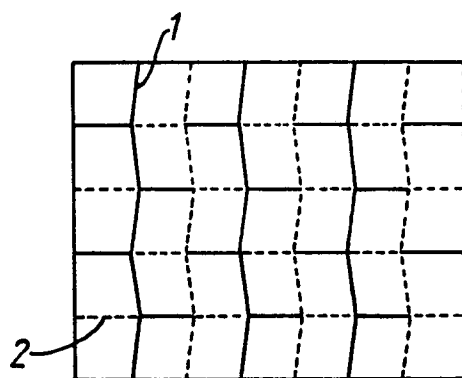


Fig. 1.

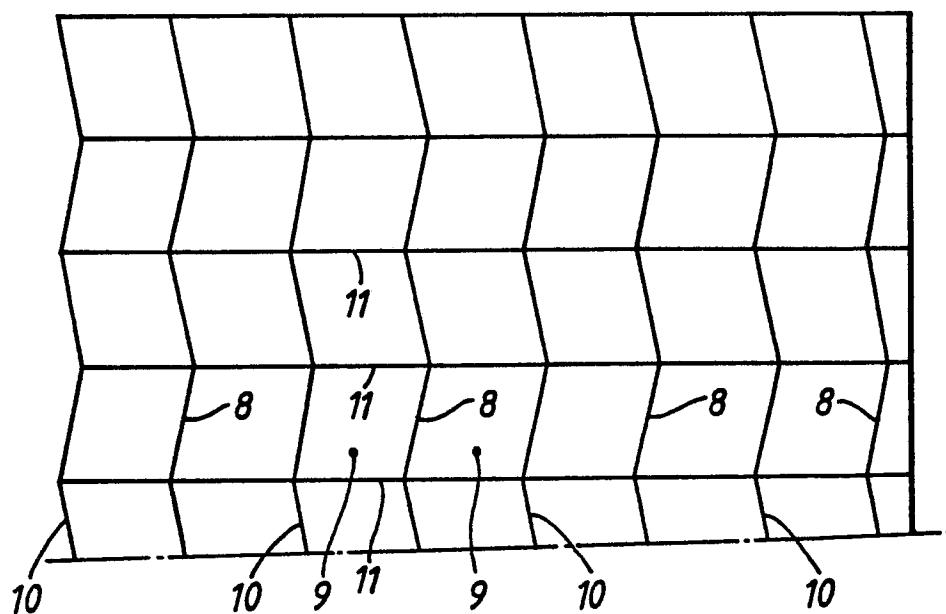


Fig. 3.

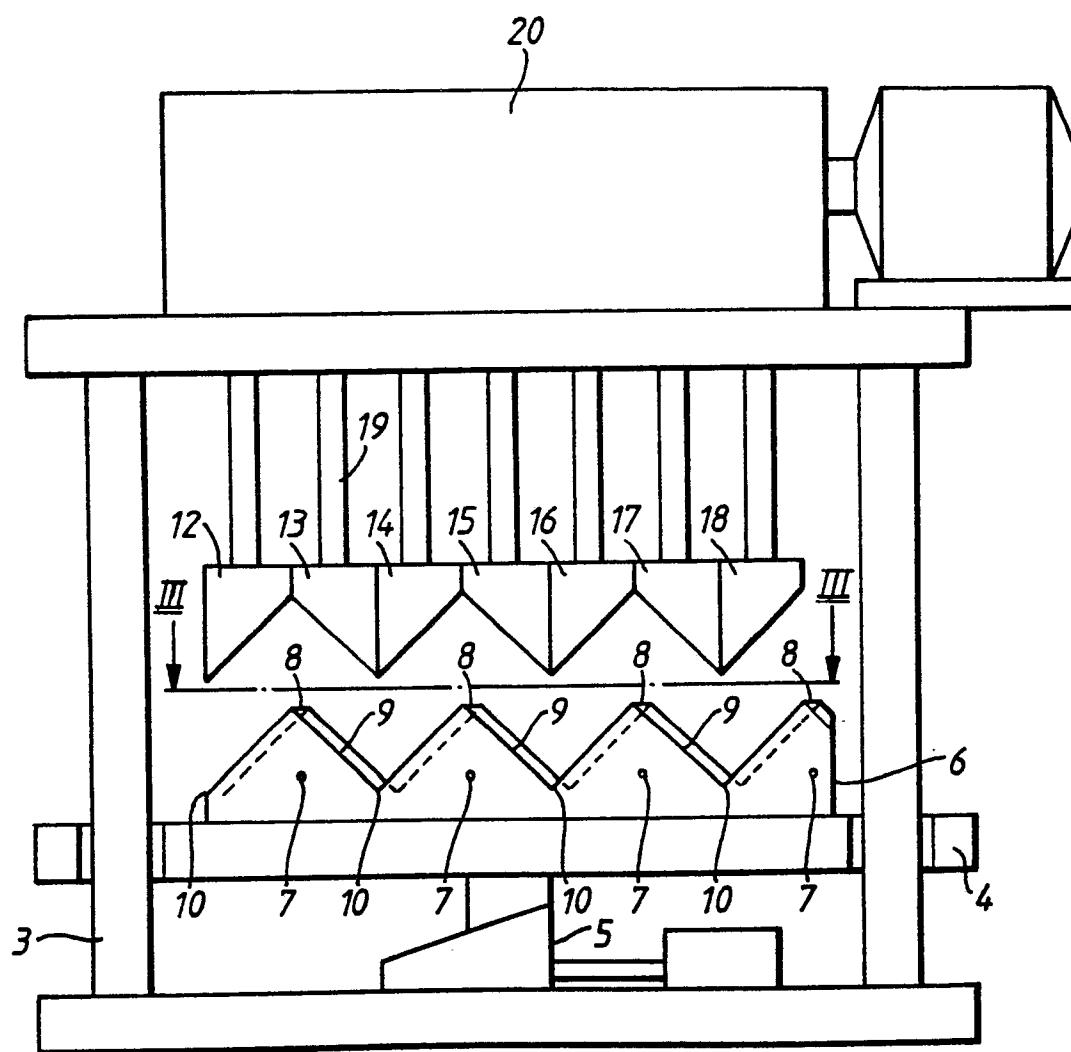


Fig. 2.



EP 90 20 0034

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.5)
D, Y	PATENT ABSTRACTS OF JAPAN vol. 5, no. 22 (M-54)(694) 10 February 1981, & JP-A-55 151460 (KOUBE SEISAKUSHO) 26 November 1980, * the whole document * ----	1-4	B65H45/12
Y	US-A-4008591 (U.S. PHILIPS CORPORATION) * column 2, line 19 - column 3, line 35; figures 1-2f * ----	1, 3, 4	
Y	US-A-3700230 (THOMAS L. COOK) * column 1, line 51 - column 4, line 4; figures 1-13 * -----	2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B65H G09B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 APRIL 1990	Examiner LONCKE J.W.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			