

[54] **APPARATUS FOR SEPARATING A
STACK OF FLAT ARTICLES INTO
SINGLE ARTICLES**

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[51] Int. Cl.B65g 59/06

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271/41

[56]

References Cited

UNITED STATES PATENTS

2,731,271 1/1956 Brown.....271/41 X
3,109,642 11/1963 Flynn.....270/61

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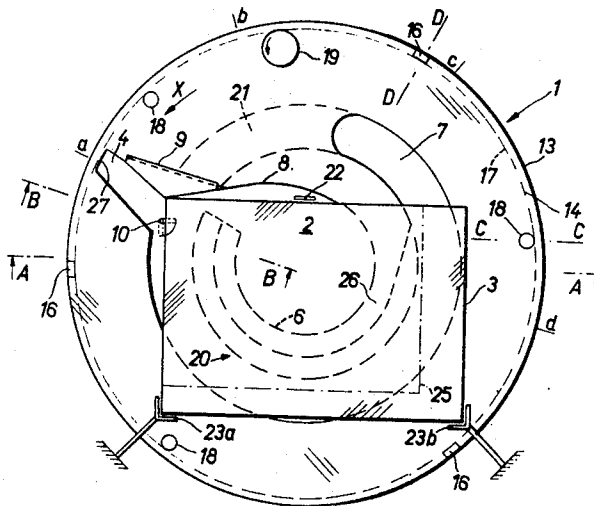
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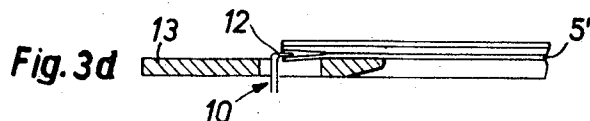
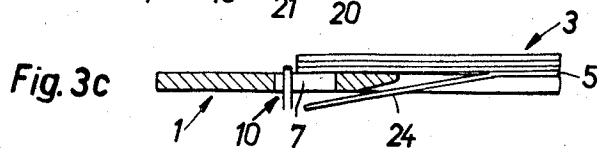
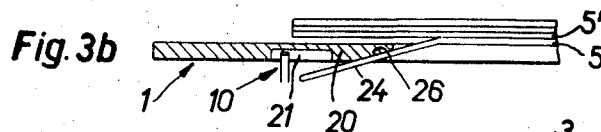
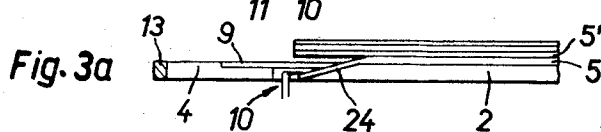
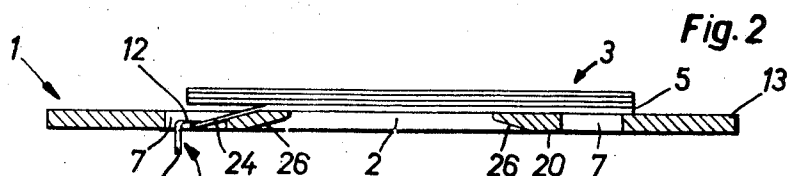
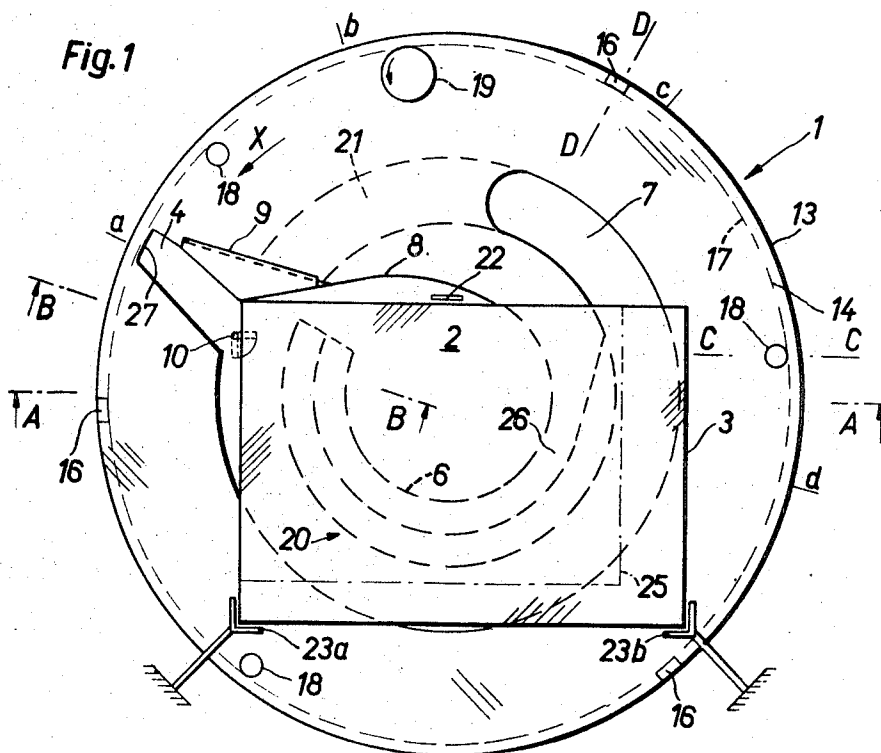
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ABSTRACT

An apparatus for removing articles one-by-one from a stack comprises a rotating table on which the stack is placed, the stack being held still. The table is formed with an opening through which the lowermost article in the stack passes on each revolution of the stack. The stack covers the axis of rotation of the table and the opening is specially shaped with a central hole connected by a generally radial slit to a part annular slit, the radial slit extending outwardly of the part annular slit to pass the article through the opening.

8 Claims, 12 Drawing Figures





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Fig. 4

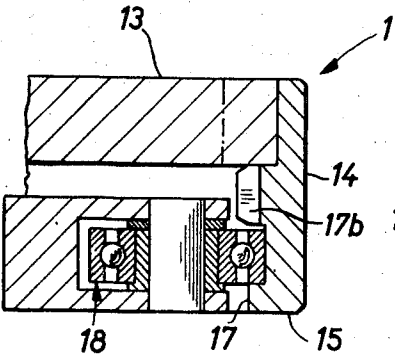
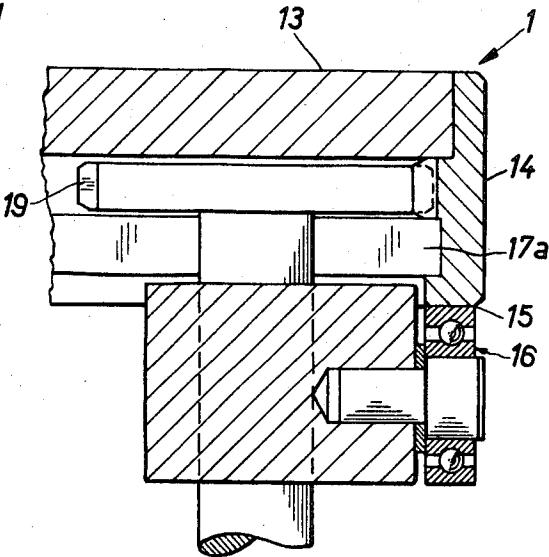


Fig. 5



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Fig. 6a

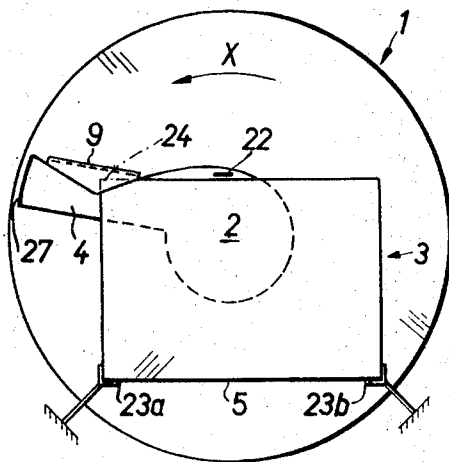


Fig. 6b

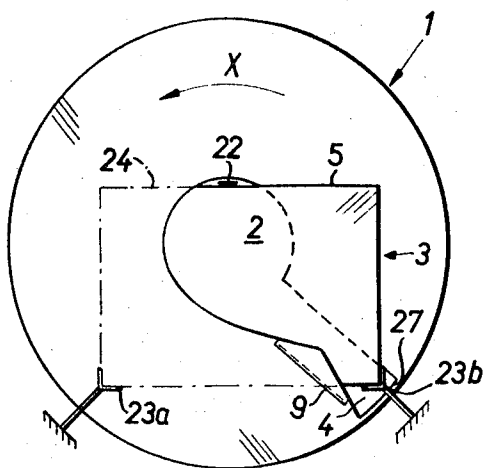
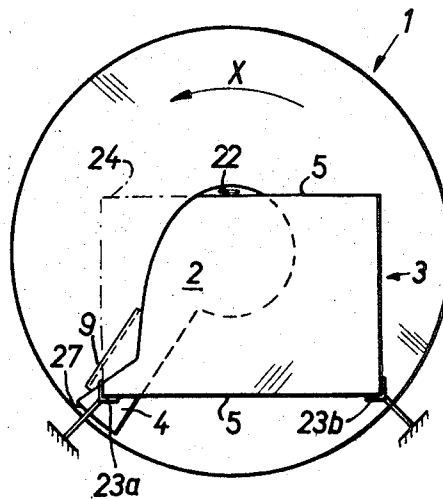


Fig. 6c

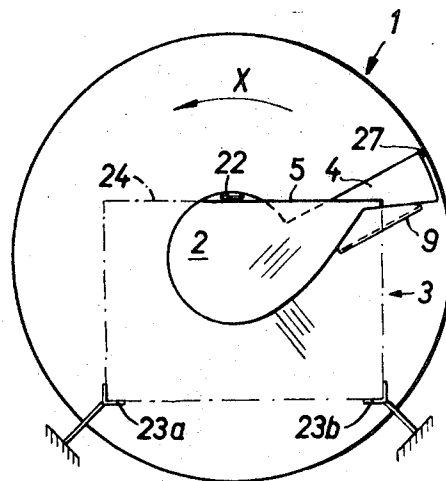


Fig. 6d

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APPARATUS FOR SEPARATING A STACK OF FLAT ARTICLES INTO SINGLE ARTICLES

The invention relates to apparatus for separating a stack of flat articles into single articles with a table for supporting the stack and rotatable in respect thereto, which has an opening that in the course of rotation of the table separates the article nearest it from the stack and releases it.

In a known or previously proposed such apparatus, there is a generally round table with a section cut out, which table is secured to a drive shaft by a boss. The stack to be separated lies to one side of the boss on the table. To support the stack securely and to avoid damage to the articles as far as possible, the lowermost article in the stack must lie with practically its whole surface on the table. The opening for the respective lowermost article to pass through during rotation in the known apparatus is sector-shaped and generally open to the outside, diverging side edges of the opening being at different heights. This difference in height of the side edges corresponds approximately to the thickness of the articles to be separated, the respective lowermost article in the stack being passed through the opening in the course of one rotation of the table.

However, the known apparatus has disadvantages. In particular there is a relatively large frictional resistance between the table and the article lying on the table which presses with the weight of all the articles stacked on top of it. This resistance is also large because the size of the bearing surface of the table is almost as large as the area of the stack lying on the table. Another disadvantage is the stress on the holders necessary to keep the stack stationary in respect to the rotating table which are required because of the considerable frictional resistance between table and stack. Also the table itself and its shaft with the associated bearing is subjected to a considerable strain because of the one-sided loading.

Apart from this, the known apparatus occupies a great deal of space because the radius of the table must be at least as large as the width of the articles, i.e., the diameter of the table must be at least as large as the width of the articles to be separated from the stack added to which is the diameter of the boss.

According to the invention there is provided apparatus for separating a stack of flat articles into single articles comprising a table for supporting the stack and adapted to be rotatably driven with respect thereto, the table having an opening which in the course of one rotation of the table separates the respective articles lying next to the table from the stack and releases it, the contour of the opening including the axis of rotation of the table and, independent of the position of the stack, cutting the outline of the base area of the stack at two points, means being provided so that, when a section of the contour of the opening approaches one side of the stack a corresponding side edge of the lowermost article is drawn through the opening to the other side of the table.

The invention will be described by way of examples with reference to the accompanying drawings, wherein:

FIG. 1 a diagrammatic plan view representation of an apparatus in accordance with the invention;

FIG. 2 a section through the apparatus shown in FIG. 1 along the line A—A;

FIGS. 3a-3d show sections through the apparatus shown in FIG. 1 along the line B—B at different stages in time, namely: when points marked a-d on the table in FIG. 1 lie in a fixed line marked B—B during rotation of the table;

FIGS. 4 and 5 show details of a bearing and drive system for the table on a larger scale in cross section along the lines C—C and D—D in FIG. 1; and

FIGS. 6a-6d are plan views of various sequential positions of the articles to be separated with respect to the position of rotation of the table.

As can be seen diagrammatically in FIG. 1, the apparatus comprises a revolving table 1 on which there rests a stack 3 of flat articles 5.

The table 1 is in the form of a driven disc 13 for supporting the stack 3 and rotatable with respect thereto, which disc 13 is

provided with an opening 2. The contour of this opening 2 consists of a part of the contour of a central hole 6 in the table 1, the contour of a slit 7 in the form of a sector of a ring surrounding the central hole 6 and the contour of a connecting slit 4 which extends from the hole 6 through the end of the surrounding slit 7 and radially outwards therefrom. The part of the table 1 remaining between the slit 7 and the central hole 6 forms a curved "tongue" 20. A section of the contour of the opening 2 which on rotation of the table 1 approaches one side of the stack forms an approaching edge 8 of the opening 2 for releasing an edge of the lowermost article 5 to be separated. On the underside of the table 1 there is a groove 21, open downwards, running between the ends of the ring-sector slit 7 and together with this define an annular space in which a grab arm 10 is positioned.

The stack 3 is held by three holders, two of which are angle rails 23a, 23b and the third of which is a flat holder 22. These holders 22, 23a and 23b keep the articles 5 in the stacked position and at the same time prevent the stack 3 from rotating with the table, revolving in the direction of the arrow X. The stack 3 is arranged in such a way with respect to the table 1 that its outline includes the axis of rotation of the table 1 and the base area of the stack 3 on the side towards the table 1 lies within the periphery of the table.

One of the holders in the form of an angle rail, e.g., the holder 23b, may be adjustable so that the apparatus can be used to separate a stack of articles which are smaller in size, e.g., as depicted by the dash-dot line 25 (FIG. 1).

Means for gripping the article to be separated from the stack and introduce it into the opening may be of various kinds. One possibility is to provide a blade 9 which is pivotally and adjustably linked to the approaching edge 8. This blade 9 is elastically pretensioned towards the carrying side of the table 1.

Another possibility is to provide a disconnectable gripping device arranged on the underside of the table which passes through the slit 7 to engage the article to be separated. This gripping device may either be a mechanical gripping arm 10 (FIGS. 1, 2, and 3) or alternatively a suction device (not depicted).

The drive system for the table 1 is shown in FIGS. 1, 4 and 5. The disc of the table is mounted within a rim 14 projecting downwards which extends round the disc 13. The free bottom end 15 of the rim 14 is supported on roller bearing support rollers 16. Lying against a smooth part 17a of the inner side 17 of the rim 14 there are centering roller bearing rollers 18 whilst another part 17b of the inside 17 is provided with teeth and engages with a driven pinion 19.

FIG. 2 depicts a cross section through the disc 13 of the table 1 together with articles 5 piled in the stack 3, the cross section being along the line A—A in FIG. 1. The gripping device is shown as the arm 10. A gripping rod 11 of this gripping arm 10 has at its free end a finger 12, the purpose of which is to grip the respective lowermost article 5, whilst the other end of the gripping rod 11 is connected to a drive system not depicted. The drive moves the gripping arm in the axial direction of the gripping rod 11 with reciprocating motion and brings the engaging arm 10 into engagement with the article 5 to be separated. In FIG. 2 the gripping arm 10 is shown in its lowermost position when it has drawn the edge 24 of the lowermost article 5 through the slit 7 and is still in engagement with this edge 24 when drawn through.

The curved tongue 20 is formed with an inclined surface 26 at the inner side thereof, the purpose of which is to ease the passage of the flat object 5 through the opening 2 as the disc 13 continues to rotate.

The mode of operation of the apparatus will be explained with reference to drawings 3a, 3b, 3c and 3d and 6a, 6b, 6c and 6d.

At the beginning of the separating process the gripping arm 10 is in its lowermost position and is in engagement with the side edge 24 of the lowermost article 5 to be separated (FIG. 3a). The edge 24 of the lowermost article 5, i.e., the article

nearest the disc 13, is bent downwards and drawn through the opening 2. The blade 9, which is located in the connecting slit 4 of the opening 2, simultaneously engages between the bent edge 24 and the second lowermost article 5'.

In the next position (FIG. 3b) of the table 1, when the point b on the table lies in the line B—B (FIG. 1), the gripping arm 10 is still in its lowermost position under the base of the groove 21 but it is now out of engagement with the drawn through edge 24.

Further separation of the article 5 is then achieved by the tongue 20 which penetrates with the edge having the inclined surface 26 between the objects 5, 5'.

In the position of the table 1 shown in FIG. 3c the gripping arm 10 projects upwards, through the slit 7 and is ready to penetrate between the article 5' and the article above it in the stack 3. The part of the lowermost article 5 lying in the region of the earlier bent edge 24 bends of its own accord and as the table revolves further the article 5 is separated from the stack 3.

When the first article 5 has been released the finger 12 of the already rotated gripping arm 10 (FIG. 3d) engages the corresponding edge of the next article 5' to be separated, which edge during further rotation of the disc 13 is drawn downwards as shown in FIG. 3a.

An alternative form of disconnectable gripping device is a suction device, as already mentioned. This suction device would be adjustably mounted underneath the side of the table supporting the stack. Under the action of suction prevailing in the suction device, the latter would grip the object to be separated and draw it downwards through the opening. The subsequent process of separating the object from the stack by means of the rotating table would be the same as that shown in FIGS. 3a-3d.

FIGS. 6a-6d show in a plan view various sequential positions of the article to be separated with respect to the position of the rotating table. For the sake of simplicity, certain components of the apparatus have been omitted and only certain reference numbers are repeated.

FIG. 6a shows the table 1 in its initial position in which only part of the edge 24 of the article 5 is drawn through the opening 2 in the table 1 and is held below the latter by the blade 9. The stack is held stationary by the holders 22, 23a, 23b just as before.

From FIGS. 6b and 6c it can be seen that the connecting slit 4 extends from the axis of rotation of the table 1 for such a distance that the corners of the article to be separated 5 can pass through the opening 2 without any contact with the outside edge 27 of the connecting slit 4. FIG. 6d shows the article, almost released, lying almost entirely on the other side of the table. Only a small remaining part of one edge of this article 5 is still supported by the holder 22.

What I claim is:

1. Apparatus for separating single flat articles from a stack of such articles which comprises

a table having an upper side for supporting said stack in a predetermined position thereon and a lower side, said table being rotatable about an axis under a supported stack and being provided with an opening leading from said upper side to said lower side and of a contour which embraces said axis and intersects the base outline of the supported stack in at least two points regardless of the rotational position of the table relative to the stack;

a leading edge on said table at the periphery of said opening for releasing an edge of the lowermost article in said stack;

gripping means for introducing a side edge of the lowermost article in said stack into said opening in the table from the upper side thereof when said leading edge is approaching the base outline of said stack;

drive means engaging said table to rotate the table about said axis; and

holder means for positioning said stack in said predetermined position on said table and for preventing rotation of said stack while the table is rotating.

2. Apparatus as claimed in claim 1, wherein the opening is in the form of a central hole which is concentrically surrounded by a ring-sector slit, there being a connecting slit which extends from the hole through the end of the ring-sector slit and radially outwards therefrom.

3. Apparatus as claimed in claim 1, wherein the base outline of the stack on the side towards the table lies within the periphery of the table.

4. Apparatus as claimed in claim 1, wherein said gripping means is a blade pivotally linked to the table at the periphery of the opening, the blade being elastically pretensioned toward the stack supporting side of the table and being adapted to guide the respective article to be separated into the opening.

5. Apparatus as claimed in claim 1, wherein said gripping means is a disconnectable gripping device arranged on the side of the table away from the side supporting the stack so that the gripping device can be made to project through the opening.

6. Apparatus as claimed in claim 5, wherein the gripping device includes a finger adapted to guide the respective article to be separated into the opening.

7. Apparatus as claimed in claim 5, wherein the disconnectable gripping device is a suction device.

8. Apparatus as claimed in claim 1, wherein the table is in the form of a disc within a rim which is supported and centered by rollers and with which the drive means of the table engages.

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