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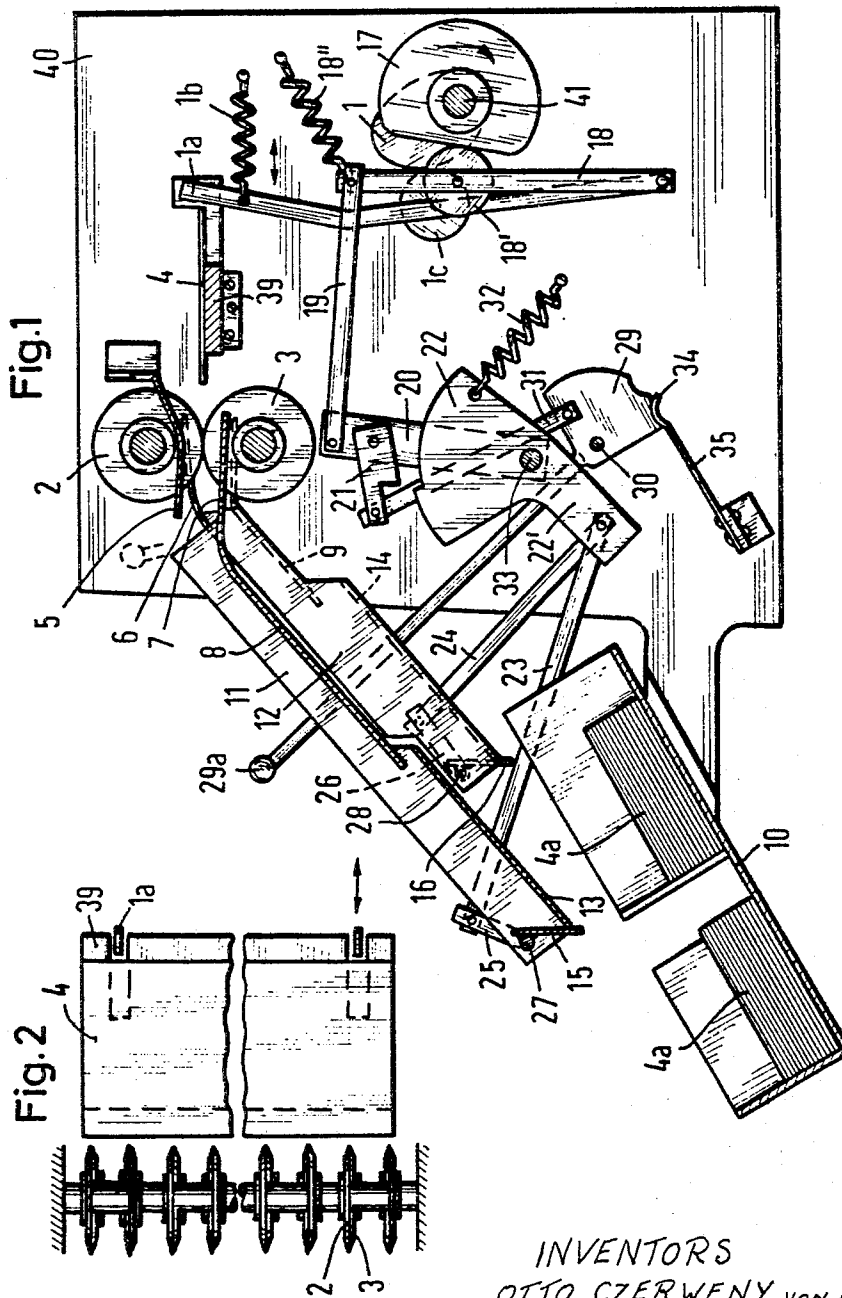
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STACKING ARRANGEMENT FOR PIECES OF SHEET MATERIAL

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

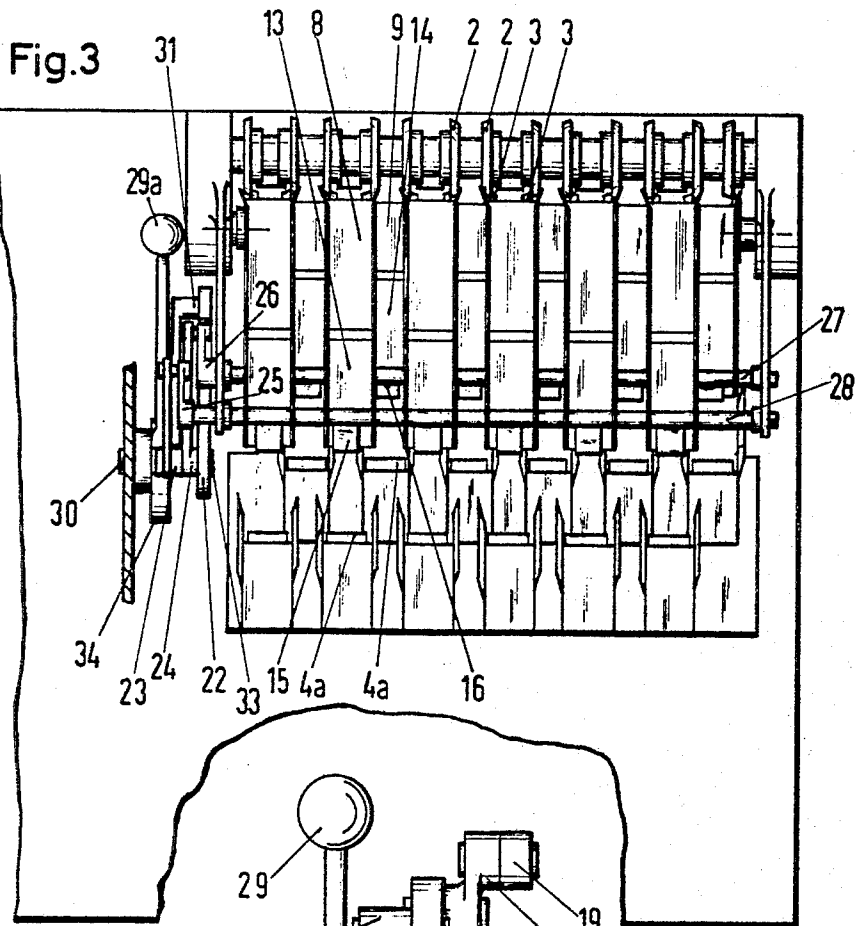
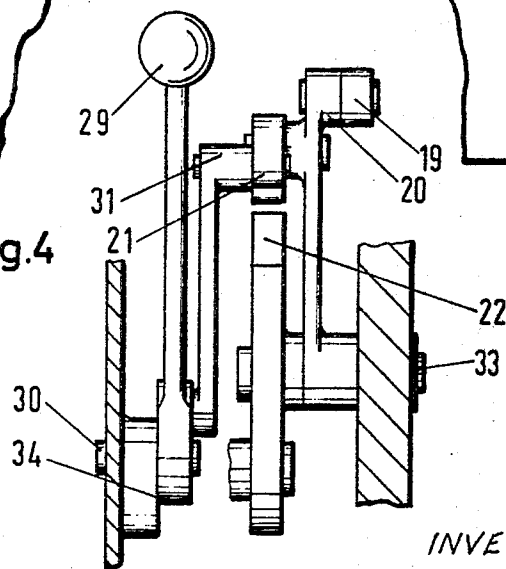


Fig.4



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STACKING ARRANGEMENT FOR PIECES OF SHEET MATERIAL

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ABSTRACT OF THE DISCLOSURE

A stacking arrangement for cardboard pieces sliced from a strip by rotary knives has feeding arms which periodically feed the strip to the knives and the sliced pieces to chutes. The bottom wall of each chute is stepped and has a downwardly offset portion near a gate normally closing the lower end of the chute. The gate is opened by a control mechanism during the interval between successive feeding steps to release one or more retained pieces and thereby to form a stack in a receptacle under the chute. While the receptacle is being emptied, a manual control overriding the mechanism keeps the gate closed.

BACKGROUND OF THE INVENTION

The invention relates to the stacking of pieces of sheet material and will be described hereinafter with reference to a stacking arrangement for pieces of cardboard sliced from a strip of the material during the manufacture of book matches.

Cardboard pieces readily form a stack in a receptacle when they are sequentially released from a chute against a wall of the receptacle. The receptacle has to be emptied or replaced from time to time, and it is necessary to interrupt the flow of the pieces from the chute while the receptacle is not available. If a continuous operation preceding the stacking is not to be interrupted, it is necessary to provide an intermediate container for temporarily retaining the pieces supplied during the interval. The known retaining arrangements are relatively complex and do not always precisely stack the pieces collected in the intermediate container.

The object of the invention is the provision of an improved, yet very simple stacking arrangement of the type described.

SUMMARY OF THE INVENTION

The improvement in the stacking arrangement resides mainly in an inclined chute and associated elements, the chute being fed with pieces of sheet material at its upper end by a feeding mechanism which is operated intermittently by a drive, and sequentially discharging the pieces to a receptacle suitably positioned so that the pieces discharged from the lower chute end form a stack in the receptacle.

The chute of this invention is provided with a gate at its lower end which retains the pieces of sheet material in the lower chute end when closed. The bottom wall of the chute, which slidably supports the pieces during their downward movement from the feeding mechanism toward the receptacle, has two consecutive portions which are respectively contiguously adjacent the gate and remote from the same, and are offset so that the adjacent wall portion is located below the plane defined by the more remote portion. A control mechanism is provided to open and close the gate.

The control mechanism is preferably synchronized with the feeding mechanism in such a manner that the gate

is closed during the feeding of pieces to the chute and opened in the intervals between successive feeding steps. Manually operated means permit the control mechanism to be inactivated and the gate to be kept closed as during removal of a previously formed stack from the receptacle. A few pieces of sheet material can thereby be collected in the lower end portion of the chute in precisely superimposed relationship if they are not longer in their direction of movement in the chute than the bottom wall portion near the gate, and the superimposed sheets can be dropped over the small distance from the gate to the receptacle without disturbing their alignment.

Other features, additional objects, and many of the attendant advantages of this invention will readily be appreciated from the following detailed description of a preferred embodiment when considered in connection with the attached drawing.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 shows a stacking arrangement of the invention and associated elements of a book match making machine in side elevational section on the line I—I in FIG. 3

FIG. 2 shows a portion of the apparatus of FIG. 1 in top plan view;

FIG. 3 is a front elevational, and partly sectional view of the apparatus of FIG. 1; and

FIG. 4 shows a detail of FIG. 3 on a larger scale.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing in detail, and initially to FIG. 1, there is seen the stationary frame 40 of the illustrated apparatus which supports a horizontal drive shaft 41. A motor, not shown, turns the shaft 41 clockwise, as viewed in FIG. 1, and also rotates two cooperating cutters comprising coaxial, axially spaced, circular blades 2, 3. A slot in the frame 40 admits strips 4 of cardboard to a horizontal, elongated table 39 which extends along the rotary cutters and is aligned with the nips of the cutting blades 2, 3. Feeding arms 1a are movable in respective longitudinally spaced, transverse slots of the table 39 to move the strip 4 into the nip of the cutting blades 2, 3 as is better seen in FIG. 2.

Stationary sheet metal guides 5, 6, 7 lead from the rotary cutters to two groups of obliquely inclined chutes 11, 12 which are directed toward corresponding compartments of a receptacle 10 which is releasably attached to the frame 40 in a conventional manner, not illustrated. The chutes are arranged on two levels, the six chutes 11 of the upper level alternating with the six chutes 12 of the lower level in the direction of the cutter axes, and the receptacle 10 is divided into twelve compartments arranged in two rows to receive stacks of pieces 4a of cardboard sliced from the strip 4 by the blades 2, 3, as is better seen in FIG. 3.

The bottom wall of each chute 11 has an upper portion 8 near the rotary cutters and a lower portion 13 parallel to the upper portion but downwardly offset from the plane of the portion 8 so as to form a step in chute 11. The bottom wall portion 13 extends to the lower end of the chute 11 which is normally closed by a gate 15. Each chute 12 similarly has two offset bottom wall portions 9, 14, and is normally closed in a downward direction by a gate 16 contiguously adjacent the wall portion 14.

The feeding arms 1a and the gates 15, 16 are operated in timed sequence by radial cams 1, 17 on the drive shaft 41. A cam follower 1c on each feeding arm 1a is held in engagement with the cam 1 by helical tension spring 1b so that the arms 1a swing toward and away from the cutter blades 2, 3 once during each revolution of the shaft 41. The face of the cam 17 has a circularly arcuate

major portion about the axis of the shaft 41, and a flat minor portion which extends along a chord subtending the arc of the major portion.

A cam follower 18' on a rocker 18 is held in engagement with the cam 17 by a spring 18''. One end of the rocker 18 is pivotally attached to the frame 40, and its free end is connected to an arm 20 by a hinged link 19. The arm 20 is movably mounted on a shaft 33 fastened to the frame 40 and carries a pivotally attached abutment 21.

The shaft also carries a segment 22 which is biased toward the illustrated position by a tension spring 32. A radial extension 22' of the segment is connected by bars 23, 24 to radial arms 25, 26 on shafts 27, 28. As is better seen in FIG. 3, the shafts 27, 28 extend along the two groups of chutes 11, 12, and carry the gates 15, 16. The segment 22 has two radially offset arcuate face portions separated by a step 22'' which may be engaged by the abutment 21 when the latter is pivoted clockwise on the arm 20 from the position shown in FIG. 1.

As is apparent from joint consideration of FIGS. 1 and 4, the abutment 21 is linked by a hinged bar 31 to an operating lever 29 rotatably mounted on a shaft 30 and equipped with a handle 29a. Two notches 34 on an arcuate face of the lever 29 may be engaged alternatively by a leaf spring 35 on the frame 40 to secure the lever in either of two angular positions. In the illustrated position, the lever, by means of the bar 31 keeps the abutment 21 out of reach of the afore-described abutment step 22'' on the segment 22. When the lever 29 is manually pivoted by means of the handle 29a until the spring 35 engages the other notch 34, the abutment 21 is aligned with the step 22''.

The afore-described apparatus operates as follows:

While the cams 1, 17 are rotated continuously by the drive shaft 41 and one cardboard strip 4 is fed to the table 39 manually or automatically during each revolution of the shaft 41, each strip is sliced into twelve pieces 4' by the blades 2, 3, and the smaller pieces of cardboard are pushed over the guides 5, 6, 7 into corresponding chutes 11, 12 and slide downward over the bottom walls of the chutes until they abut against the gates 15, 16. Because of the vertical spacing of the bottom wall portions 8, 13 in the chutes 11 and of the bottom wall portions 9, 14 in the chutes 12, successively supplied pieces of cardboard are superimposed in precise alignment. This mode of operation continues as long as the lever 29 is in the illustrated position. The closed gates 15, 16 permit the previously formed stacks of cardboard pieces 4' to be removed from the receptacle 10, or the receptacle to be released from the frame 40 in a manner not illustrated in detail, and replaced by an empty receptacle of the same shape.

The oscillations of the rocker 18 due to the rotation of the cam 17 are transmitted to the arm 20 by the link 19, and the abutment 21 moves idly back and forth in an arc centered approximately in the shaft 20. When the lever 29 is shifted by the handle 29a to its other angular position in which it may be secured by the spring 35, the abutment 21 is swung toward the shaft 20 so that it engages the step 22'' and the gates 15, 16 are opened against the biasing force of the spring 32 once during each revolution of the shaft 41 while the cam follower 18' engages the major arcuate portion of the cam 17, and are closed by the spring 32 only during the shorter interval during which the cam follower 18' travels over the straight portion of the cam face. The angular setting of the cams 1, 17 on the shaft 41 is such that the slicing operation is completed when the gates are closed so that each piece 4' of cardboard is stopped during its downward travel before being released to the receptacle 10. Very precise positioning of the pieces in the receptacle is achieved by the low velocity of the piece 4' at its discharge from a chute 11, 12.

Stacks of cardboard pieces are built up in the several compartments of the receptacle 10 until the lever 29 is returned to the illustrated position, thereby disengaging a coupling in the motion transmitting train between the cam 1 and the gates 15, 16 formed by the abutment 21 and the step 22'' as the input and output members respectively, and thereby inactivating the automatic gate opening and closing mechanism.

It should be understood, of course, that the foregoing disclosure relates only to a preferred embodiment of the invention, and that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of the disclosure which do not constitute departures from the spirit and scope of the invention set forth in the appended claims.

What is claimed is:

1. A stacking arrangement for pieces of sheet material including an inclined chute, feeding means for sequentially feeding pieces of sheet material to the upper end of said chute, drive means for operating said feeding means, and supporting means for supporting a receptacle at the lower end of the chute in such a position that the pieces of sheet material sequentially discharged by gravity from said lower end form a stack in the receptacle, the improvement in the chute which comprises:

(a) gate means at said lower end adapted to be closed for retaining pieces of said sheet material in said chute at said lower end of the same,

(1) said chute having an obliquely inclined bottom wall slidably supporting said pieces during downward movement of the same from said feeding means toward said receptacle,

(2) respective consecutive portions of said bottom wall adjacent said gate means and remote from said gate means being offset in such a manner that said adjacent portion is downwardly spaced from a plane defined by said remote portion; and

(b) control means for opening and closing said gate means.

2. In an arrangement as set forth in claim 1, said portions of said bottom wall being elongated in a direction from said feeding means toward said receptacle, and said adjacent portion being contiguously adjacent said gate means.

3. In an arrangement as set forth in claim 1, said control means including motion transmitting means connecting said gate means to said drive means for opening and closing of said gate means in timed sequence with the feeding of said pieces to said upper end.

4. In an arrangement as set forth in claim 3, said motion transmitting means including means closing said gate means during the feeding of each of said pieces to said upper end and opening said gate means in the interval between the feeding of successive pieces of said sheet material.

5. In an arrangement as set forth in claim 3, manually operated means overriding said control means for keeping said gate means closed during operation of said feeding means.

6. In an arrangement as set forth in claim 5, biasing means biasing said gate means toward the closed position, said manually operated means being effective for inactivating said control means.

7. In an arrangement as set forth in claim 5, said motion transmitting means including coupling means having input and output portions respectively connected to said drive means and to said gate means and engageable for movement of said gate means by said drive means, said manually operated means including means for engaging and disengaging said coupling means.

8. In an arrangement as set forth in claim 6, said manually operated means including an operating member mounted for angular movement between two angular positions spaced from each other, and linking means con-

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necting said operating member to said coupling means for engaging the same in one of said angular positions of said member, and for disengaging the coupling means in the other angular position.

9. In an arrangement as set forth in claim 7, said drive means including a cam member and means for continuously rotating said cam member, said motion transmitting means including a segment member mounted for angular movement, and cam follower means engaging said cam member and connected to said coupling means for reciprocating the input portion thereof, sad segment member carrying the output portion of said coupling means, and said linking means including means for moving said input portion between an operative position in

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which said input portion engages said output portion during said reciprocating movement thereof, and an inoperative position spaced from said output portion.

10. In an arrangement as set forth in claim 8, yieldably resilient means for securing said operating member in each of said two positions thereof.

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