June 18, 1957 G. L. ROBERTSON 2,796,256

TRANSFER DEVICE WITH SPRING JAWS FOR GRIPPING SHEET MATERIAL

Filed Dec. 5, 1955 2 Sheets-Sheet 1

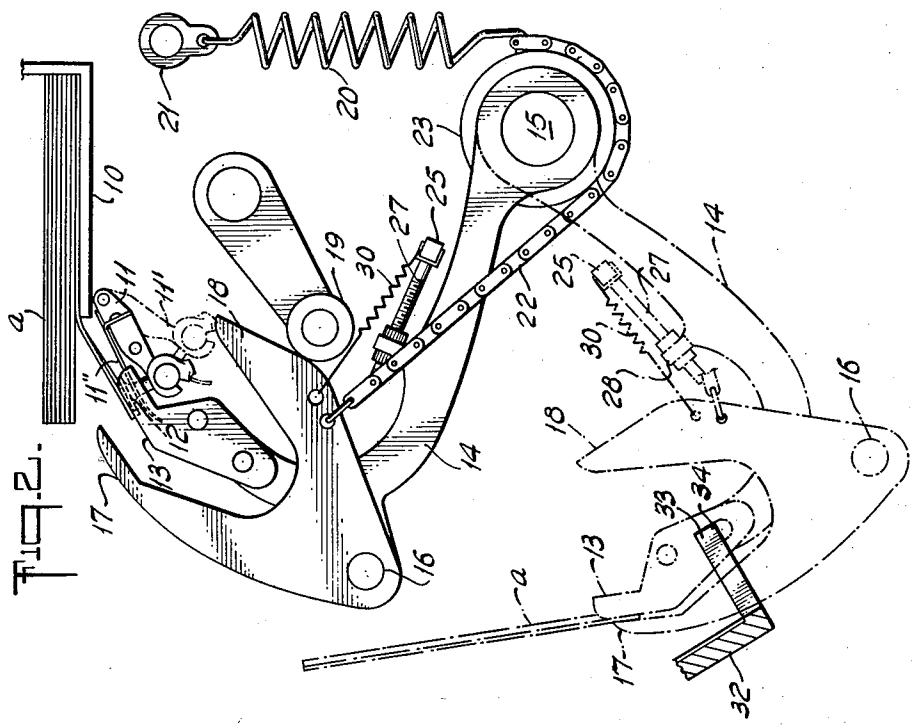


Fig. 2.

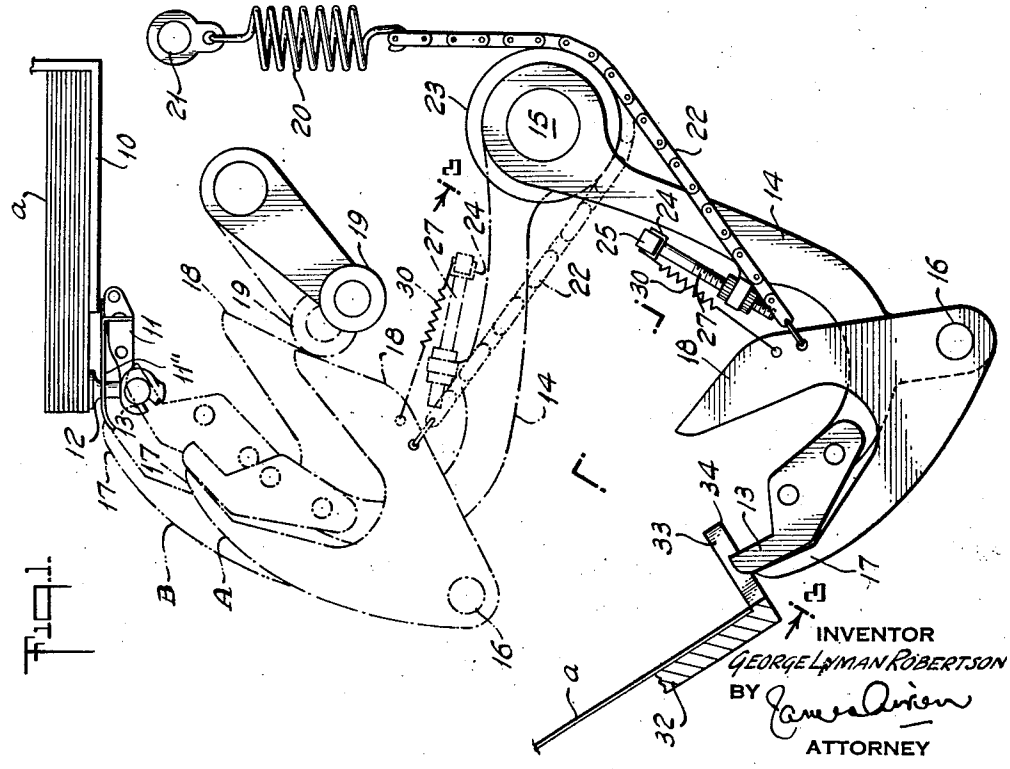


Fig. 1.

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Fig. 3.

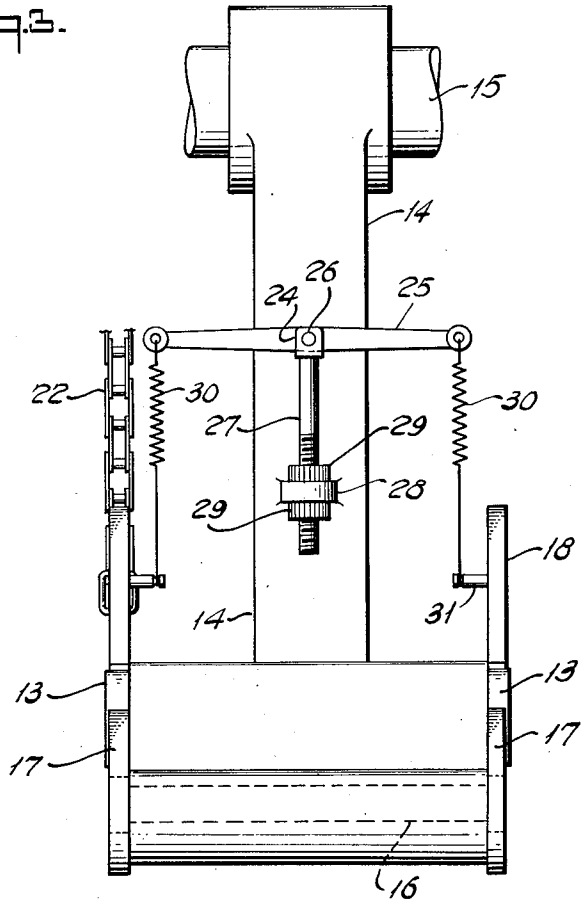


Fig. 4.

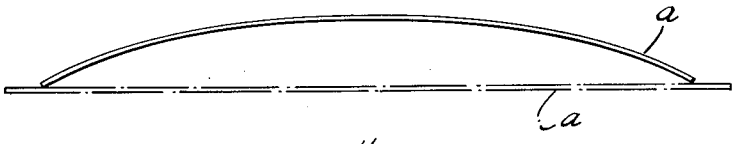
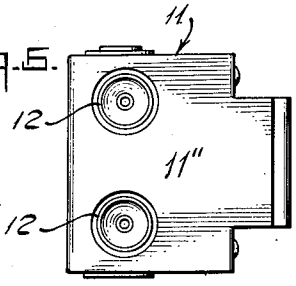


Fig. 5.



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TRANSFER DEVICE WITH SPRING JAWS FOR GRIPPING SHEET MATERIAL

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14 Claims. (Cl. 271—11)

This invention relates to mechanical means for use in bookbinding and other machines for transferring single folded or unfolded sheets from a stack of such sheets to suitable means for conveying the sheets successively to another location in the machine for a further step in the operation, and the invention relates more particularly to sheet-handling mechanism of the type in which an oscillating arm carries a suction cup which engages the lowermost sheet in the stack and lowers one edge thereof into position to be grasped by two pairs of gripping jaws spaced from each other and carried by a swinging arm whereby the sheets are successively drawn from the stack and are delivered to an inclined or other table or surface along which they may be successively fed to another location.

One object of the present invention is to provide the gripping jaws with relatively strong spring mechanism for holding the jaws in the closed position while the sheets are being drawn from the stack and to provide auxiliary spring means whereby both pairs of jaws are held in their closed position with light pressure exactly equal in both pairs just before the delivery of each sheet to the said table or surface.

Another object of the invention is to so arrange the pairs of gripping jaws that, during conveyance of each sheet from the stack to the said surface, the leading edge of the sheet is bowed in such manner that the side edges of the sheet engage the said surface before it is engaged by the central part of the sheet.

Still another object of the invention is to so control the swinging movement of the suction cup that it moves downwardly to bring the sheet into position for engagement with the gripping jaws and is then moved further downwardly out of contact with the sheet so that, during withdrawal of the sheet from the stack, the underside of the sheet does not rub against the surface of the suction cup and cause undue wear thereof.

Other objects and advantages of the invention will appear more fully from the following description, especially when taken in conjunction with the accompanying drawings which form a part hereof.

In the arrangement shown in the drawings, the sheets are fed successively from a stack to an inclined table, along which they may be conveyed by an endless band or other suitable or convenient conveying mechanism.

An important feature of the present invention is that the arrangement of the auxiliary spring insures that, at the instant of release of the sheet by the two pairs of jaws, the light pressure of the jaws upon the sheet shall be exactly uniform, and means are provided for fine adjustment of the auxiliary springs so that sheets of very thin paper may be delivered to the receiving surface without danger of damage thereto.

Fig. 1 is a side view showing the gripping jaws in three different positions; Fig. 2 is a similar view showing the jaws in two different positions; Fig. 3 is a front view in the direction of the line 3—3, Fig. 1; Fig. 4 is a diagram showing the bowed sheet as it is delivered; and Fig. 5 is a plan view of the suction device.

Referring particularly to Figs. 1 and 2, the sheets *a* are stacked upon a support **10** and an oscillating arm **11** carries suction cups **12** that project through openings in a spring plate **11''** and are adapted to engage the underside of the lowermost sheet and to bend it downwardly into the position shown in Fig. 2, and the plate **11''** engages the sheet and insures even contact of the cups **12** with the paper. The lowered portion of the sheet *a* is thus brought into close contact with the gripping surface of the jaw members **13**, both of which are fixed to a swinging arm **14** pivotally mounted on a rocking shaft **15** by which the arm **14** is swung by suitable mechanical means in properly timed relation to the movement of the arm **11**.

Pivotally mounted at **16** on the arm **14** are two gripper jaw members **17** which cooperate with the jaw members **13** to grip the sheet at both sides of the suction cups **12**, and the arrangement is such that the cooperation of the jaw members **17** with the jaw members **13** causes the leading edge of the sheet to form a bow.

In the position shown in full lines in Fig. 2, the jaw members **13**, **17** are held open by engagement of swinging rolls or cams **19** with cam pieces **18** integral with the jaw members **17**, and movement of the rolls **19** from the position shown in Fig. 2 into the full-line position shown in Fig. 1 causes the jaws **13**, **17** to close under the action of two springs **20** which are anchored at **21** and have extension chains **22** extending around collars **23** freely mounted on the shaft **15**, and as the rolls **19** move clear of the parts **18** the jaws are closed tightly upon the leading edge of the sheet *a* and the arm **14** is then swung downwardly into the position shown in dot-and-dash lines in Fig. 2 so that the sheet is completely withdrawn from the stack, and during this withdrawal the arm **11** is moved downwardly into the position **11'** shown at Fig. 2 so that the surface of the suction cup is not marred by rubbing against the under surface of the paper during the withdrawal from the stack.

When the gripping jaws and the rocking arm **14** are in the position shown in dot-and-dash lines in Fig. 2 and in the position shown in full lines in Fig. 1, the springs **20** are no longer under tension and the jaws **13**, **17** are held in the closed position only by means of the auxiliary spring device (see also Fig. 3), comprising a cross-bar **25** pivoted at **26** in the forked end **24** of a screw-threaded stem **27** extending freely through an opening in a bracket **28** on the arm **14** and having adjusting nuts **29** by means of which the stem **27** may be regulated to vary the tension of two auxiliary springs **30** extending between the ends of the cross-bar **25** and suitable pins **31** on the parts **18** of the jaw members **17**. Due to the freedom of the cross-bar **25** to swing about the pivot **26**, the pressure of the gripping jaws is equalized and by adjustment of the stem **27** within the bracket **28** through the medium of the nuts **29** the exact tension of the springs **30** may be accurately regulated to suit the thickness, quality or strength of the paper being handled.

The full lines in Fig. 1 show the position of the gripping jaws after the delivery of a sheet to the inclined surface of a table **32** after the jaws have passed through suitable gaps **33** in a shelf **34**. In the position shown, the leading edge of the bowed sheet has been engaged by the upper surface of the shelf **34** and the sheet has automatically assumed a flat position upon the inclined surface **32** and the jaws may then be moved upwardly to receive the next successive sheet.

In the position shown in dot-and-dash lines at A, Fig. 1, the jaws **13**, **17** are in the closed position, but the upper extremity of the parts **18** have moved into engagement with the rolls **19** which are in the position shown in dot-and-dash lines, and as the jaws are raised into the position shown in dot-and-dash lines at B, Fig. 1, the

jaws **13**, **17** are opened by the action of the said rolls **19** and the jaws are then in the position shown in full lines in Fig. 2 in readiness to receive and close upon the portion of the next sheet drawn downwards by the suction cup **12**, and as the sheet is drawn from the bottom of the stack by the downward movement of the arm **14**, the springs **20** exert the necessary pressure on the jaws until a lower position has been reached and the springs **20** are no longer under tension and the jaws are then retained in their closed position solely by the equalized and finely regulated tension of the auxiliary springs **30**.

While one embodiment of the invention has been described herein, it is to be understood that it is not intended as a limitation except within the scope of the claims hereto or hereinafter appended.

What I claim is:

1. Mechanism for delivering sheets successively from a stack of such sheets, comprising two pairs of gripping jaws, a swinging arm carrying said jaws to convey the sheets successively from said stack to the point of delivery, spring means for holding the jaws firmly in the gripping position while each sheet is drawn from the stack, auxiliary spring means for holding the jaws in contact with the sheet at the point of delivery, and means for equalizing the auxiliary spring pressure in the two pairs of jaws.

2. A sheet transferring device of the character described, comprising a rocking arm, two sheet-gripping surfaces spaced from each other and carried by the arm in fixed relation thereto, two movable jaws pivotally mounted with respect to said arm and having surfaces cooperating with said fixed surfaces to grip the sheets, spring means for actuating the said pivoted jaws to grip the sheet at points spaced from each other, auxiliary spring means acting on the said pivoted jaws to hold the said surfaces in relatively light engagement with the sheets when said pivoted jaws are not acted upon by the first-mentioned spring means, and a screw adjustment device carried by said rocking arm to adjust and equalize the pressure exerted by the said auxiliary spring means.

3. Mechanism according to claim 1, comprising an oscillating arm, and a suction cup carried by said arm and engaging the under surface of successive sheets to move them into position for engagement by the gripping jaws.

4. Means according to claim 1, comprising a movable suction cup for drawing the lowermost sheet in the stack into position for engagement by said jaws, and means for moving said suction cup to a lower position out of contact with the underside of the sheet while the sheet is being withdrawn from the stack by said gripping jaws.

5. Means according to claim 1, comprising a movable suction cup for engaging the central part of the lower sheet in the stack near one edge thereof, means for moving the said cup into a position between the pairs of jaws, and means for closing the jaws upon the edges of the sheet while said jaws and said cup are so located with respect to each other that the said edge of the sheet is bowed, and a stop member for engaging the bowed edge of the sheet after removal of the sheet from the stack.

6. Sheet transfer means according to claim 1, in which the auxiliary spring means comprises a screw-threaded

stem carried by the rocking arm, a crosshead pivoted on the stem, springs connecting the ends of said crosshead with the said pairs of jaws, and adjusting means for regulating the position of said stem with respect to the rocking arm to regulate the tension of the auxiliary springs to provide light and equal pressure of the jaws on the sheet.

7. Mechanism according to claim 1, comprising a surface for receiving the sheets successively conveyed from the stack, and a ledge for engagement with the leading edges of the sheets as they are delivered to said surface and as they are released by the gripping jaws.

8. Mechanism according to claim 1, comprising a ledge for engagement with the leading edge of the sheet while it is still gripped with gentle equalized pressure by both gripping jaws, and gaps in said ledge for the passage of said jaws.

9. Mechanism according to claim 1, in which the means for equalizing the auxiliary spring pressure comprises a swinging crosshead having each end thereof connected to one pair of jaws through an auxiliary spring, a pivot for said crosshead, and screw and nut means for adjusting the position of said pivot to finely adjust and equalize the tension of the auxiliary springs.

10. Mechanism for transferring sheets from a stack, comprising a rocking arm, two jaws fixed thereto and spaced from each other, two pivoted jaws carried by said arm and arranged so as to cooperate with the fixed jaws, cam means for opening the jaws to receive the said sheet, a suction device for holding the sheet in position for engagement with the jaws, springs for drawing the pivoted jaws towards the fixed jaws to grip the sheet, means for moving the suction device out of contact with the sheet throughout the movement of withdrawal of the sheet from the stack, rotary collars arranged in line with said springs, anchoring members attached to said springs and engaging said collars to tension the springs when the jaws are in the sheet withdrawing position and to release the tension when the jaws are in position for delivery of the sheet, and auxiliary springs for exerting relatively light and equalized tension on the said jaws to grip the sheet with only gentle pressure during the delivery of the sheet at the completion of the operation.

11. Mechanism according to claim 10, in which the jaws are so located in relation to the suction device that the sheet is bowed by the grip of the spaced jaws.

12. Mechanism according to claim 10, comprising screw means for the delicate adjustmentof the auxiliary springs to vary the equalized tension to suit the strength and quality of the material of the sheets.

13. Mechanism according to claim 10, in which the suction device comprises a swinging arm, a spring plate secured to said arm, and suction cups projecting through openings in the said plate.

14. Mechanism according to claim 1, comprising a suction device for moving the lowermost sheet into position for engagement by the said jaws, comprising a pair of suction cups for contacting the sheet, a pivoted arm carrying said cups, a spring metal plate carried by and projecting beyond said arm, and two openings formed in said plate for the accommodation of said cups.

No references cited.