Nov. 24, 1964 R. R. TARBUCK 3,158,367

PNEUMATIC SHEET SEPARATOR

Filed Oct. 23, 1959

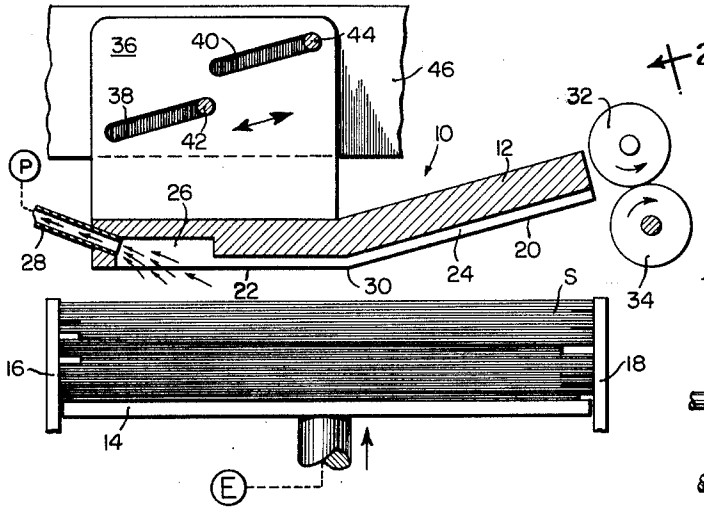


Fig. 1

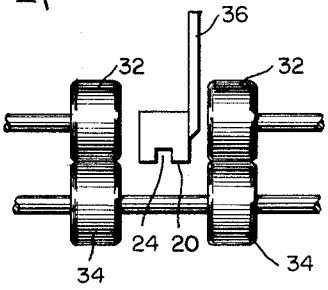


Fig. 2

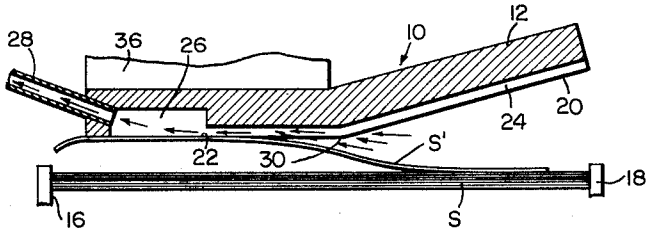


Fig. 3

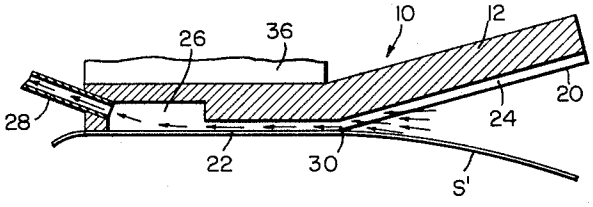
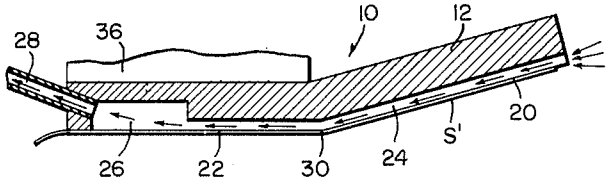


Fig. 4

Fig. 5



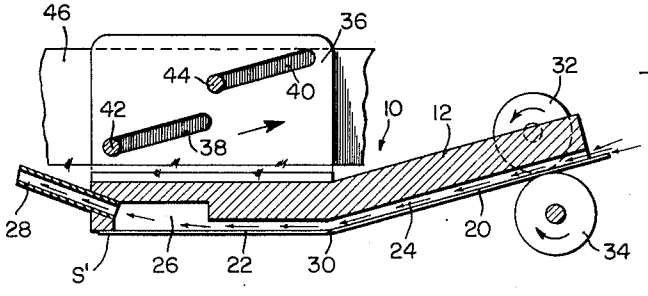


Fig. 6

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PNEUMATIC SHEET SEPARATOR

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This invention relates generally to sheet feeding systems and more particularly to improvements in devices for separating sheets individually and successively from a stack of sheets.

Presently known devices for separating a sheet from the top or end of a stack have applied air to the sheet by means of suction or vacuum heads. These devices have been open to certain objections. First, the high vacuum employed tends to separate additional sheets in excess of the topmost one where the sheet material is semi-porous or pervious to air. Also, when separating sheets from the top of a stack of mixed sheets of various sizes, where the stack has not been jogged or previously edge-aligned, it is necessary to limit the position of the vacuum head to the least common area of the various sheets in the stack. In such case, certain areas of the separated sheets will not be supported by the vacuum head but will hang down limply thus making delivery of the separated sheets to associated forwarding devices more difficult.

The principal object of the present invention is to provide a sheet separating device of improved design which will avoid the above-mentioned difficulties.

Another object of the invention is to provide a pneumatic device for separating sheets one at a time in succession from the top or end of a stack of sheets.

A further object of the invention is to provide such a device which may be operated selectively either by vacuum or positive air pressure.

These and other objectives will be more fully revealed in the following detailed description of a specific embodiment of the invention when read in conjunction with the accompanying drawings in which:

FIG. 1 is one form of sheet feeding apparatus embodying the invention;

FIG. 2 is a view taken in the direction of arrows 2—2 of FIG. 1;

FIGS. 3 and 4 show progressive stages of a sheet being separated from the top of a stack;

FIG. 5 shows the sheet completely separated from the stack; and

FIG. 6 illustrates one method of stripping the sheet from the separating device.

Considered briefly in its broad aspects, the invention comprises a sheet separating head through which a stream of air is passed at high velocity to create a low pressure area above the top sheet of a stack adjacent to one end of the sheet. This causes the end portion of the sheet to rise toward the head whereby the low pressure area gradually extends toward the opposite end of the sheet to effect a progressive separation or "peeling" of the sheet from the top of the stack.

Referring to the drawings, the invention comprises an elongated body or head **10** constructed in the form of an air foil and preferably of rectangular cross-section and having an end portion **12** disposed at an acute angle with the top of a stack of sheets S, the stack being supported on an elevating table **14** between fixed end guides **16** and **18**. The bottom surfaces **20** and **22** of head **10** are formed flat and provided with a groove **24** which terminates in an enlarged portion **26**. A hose **28** secured to head **10**, at an acute angle to the bottom surface **22**, communicates with the enlarged portion **26** for applying optionally either vacuum or positive air pressure to the

top of the stack S from a suitable source such as a reversible pump P.

The operation will be described with respect to the use of vacuum, however, it will become apparent hereinafter that the use of positive air pressure will effect a separation of the sheets from the stack equally as efficient as the use of vacuum.

In operation, vacuum is applied through hose **28** from the source P. The air moves at high velocity thus creating a low pressure area in the enlarged portion **26** and in the immediate vicinity thereof above the top of stack S causing the leftward portion of the top sheet S′ to rise and adhere to head **10**, as seen in FIG. 3, by reason of the atmospheric pressure below the top sheet. As the sheet S′ thus covers or seals the enlarged portion **26**, the low pressure area on the top of sheet S′ expands along groove **24** toward the right causing additional portions of the sheet to separate or "peel" progressively from the stack and similarly adhere to head **10** as shown in FIG. 4. Sheet S′ then bends around the heel **30** at the intersection of surfaces **20** and **22** and the action progresses until the entire top sheet has been separated from the stack and is now held to head **10** as seen in FIG. 5. The bend at heel **30** causes any additional sheets which may have adhered to the top sheet S′ to separate from the top sheet and drop back to the stack S.

The separated sheet S′ may be stripped from head **10** in any well known manner, however, by way of example, head **10** is illustrated as being movably mounted for conveying the separated sheet S′ to forwarding rollers **32** and **34** for delivery to its destination. For such purpose, head **10** may form part of a carriage means and may be secured to a vertical supporting member **36** thereof having elongated slots **38** and **40** parallel to surface **20** and slidably engaged on pins **42** and **44** fixed to a stationary member **46**. The supporting member **36** and head **10** may then be moved rightwardly to the position shown in FIG. 6 by any suitable means, not shown, to deliver the leading edge of sheet S′ into the nip of forwarding rollers **32** and **34**.

As the sheets are separated individually and successively from the stack S, the stack is advanced accordingly to a predetermined feeding level by means of a suitable mechanism E adapted for elevating the table **14**.

What is claimed is:

1. A device for separating the end sheet from a stack of sheets comprising, an elongated body having a first flat surface and a second flat surface at an angle to the first flat surface and having a groove in said surfaces extending longitudinally of the body from one end of said second flat surface, means for positioning said body with the first surface adjacent and substantially parallel to the end sheet of said stack and said second surface at an acute angle to said sheet, and means for optionally applying a stream of high velocity air under vaucuum or positive pressure longitudinally through a portion of the groove in the first surface to cause said sheet to adhere successively to said first and second flat surfaces and seal as least a portion of said groove, the air continuing to flow through said groove through said one end after said sealing of said portion of said groove.

2. A pneumatic device for separating the end sheet from a stack of sheets comprising, an elongated body having a flat side and an elongated groove in said side extending longitudinally of the body from one end thereof, means for supporting said body with its flat side adjacent and substantially parallel to the end sheet of said stack, means for advancing the stack towards the body, and means for optionally introducing a stream of high velocity air under vacuum or positive pressure through a portion of said groove and for directing said air to flow at an acute angle to said flat side and in the direction of said groove to cause said end sheet to adhere to said flat side

and seal at least a portion of said groove, the air continuing to flow through said groove through said one end after said sealing of said portion of said groove.

3. A sheet separator for removing sheets one at a time in succession from a stack of sheets comprising, an elongated body having first and second flat surfaces at an angle to each other and having a groove in said surfaces extending longitudinally of the body from one end thereof, means for supporting the body with said first surface adjacent and substantially parallel to the end sheet of said stack and with said second surface at an acute angle to said sheet, means for advancing the stack of sheets toward said body means for optionally applying a stream of high velocity air under vacuum or positive pressure through a portion of the groove in said first surface to separate the top sheet from the stack and cause it to adhere progressively and in succession to said first and second surfaces, to seal at least a portion of said groove, the air continuing to flow through said groove through said one end of said body after said sealing of said portion of said groove, and means to strip the separated sheet from said surfaces.

4. A mechanism for removing workpieces individually from a stack comprising, means for supporting a stack of workpieces, an air foil disposed over the stack and having a first portion adjacent to the stack at a point remote from a free edge of the uppermost workpiece of the stack and diverging relatively to the stack toward a second portion disposed substantially over and in spaced relation to the free edge of the workpiece, means for directing a stream of air along said air foil, means for providing and for controlling a supply of air to said directing means, and movable carriage means including a flat workpiece supporting surface which is flat in the direction of movement of the carriage means, said carriage means being reciprocably movable in translation in a direction substantially parallel to the plane of said workpiece supporting surface and providing a support for conveyance of the workpiece from the stack after the free edge of the workpiece has been raised from the stack by the action of said air foil.

5. An apparatus for removing workpieces individually from a stack comprising, a platform for supporting a stack of workpieces, an air foil disposed in a first position over the stack and having a first portion adjacent to the stack at a point remote from a free edge of the endmost workpieces of the stack and diverging relatively to the stack toward a second portion disposed near and in spaced relation to the free edge of the workpieces, said air foil being movable in translation to said first position for removing a workpiece from the stack and being reciprocably movable in translation from said first position to a second position for conveying and delivering the workpiece to subsequent devices, means moving with said air foil for directing a sole stream of air along said air foil in such manner that it cooperates with the air foil for removing a workpiece from the stack and holds the workpiece against the air foil for conveying and delivering the workpiece to said subsequent devices, and means for providing and for controlling a supply of air to said directing means.

6. A mechanism for removing workpieces individually from a stack comprising, means for supporting a stack of workpieces, an air foil disposed in a first position over the stack and having a first portion adjacent to the stack at a point remote from a free edge of the uppermost workpiece of the stack and diverging relatively to the stack toward a second portion disposed substantially over and in spaced relation to the free edge of the workpiece, said air foil being movable in translation to said first position for removing a workpiece from the stack, and being reciprocably movable in translation from said first position to a second position for conveying and delivering the workpiece to subsequent devices, means carried by and moving with said air foil for directing a stream of air along said air foil from said first portion toward said second portion in such manner that it cooperates with the air foil for removing a workpiece from the stack and for conveying and delivering the workpiece to said subsequent devices, means for providing and for controlling a supply of air to said directing means, and carriage means supporting and moving said air foil, said carriage means including a flat surface which is flat in the direction of movement of the carriage means for supporting a workpiece being conveyed and delivered by said air foil and being reciprocably movable in translation in a direction substantially parallel to the plane of said flat surface.

7. A mechanism for removing sheets individually from a stack comprising, means for supporting a stack of sheets, an elongated body disposed over the stack and having a first portion adjacent to the stack at a point remote from a free edge of the uppermost sheet of the stack and diverging relatively to the stack toward a second portion disposed substantially over and in spaced relation to said free edge of the sheet, said elongated body having an elongated groove common to said first and second portions and extending longitudinally of the body, means for directing a stream of air longitudinally through a portion of said groove in such manner that it will flow substantially parallel to said end sheet to cause said end sheet to rise from the stack and adhere to said elongated body and seal at least a portion of said groove, means for providing and for controlling a supply of air to said directing means, and movable carriage means including a flat sheet supporting surface which is flat in the direction of movement of the carriage means, said carriage means being reciprocably movable in translation in a direction substantially parallel to the plane of said sheet supporting surface and providing a support for conveyance of the sheet from the stack after the sheet has been raised from the stack by the action of said air stream.

References Cited in the file of this patent

UNITED STATES PATENTS

1,418,145	Fischer	May 30, 1922
1,495,881	Bunger	May 27, 1924
1,635,626	Liljebladh	July 12, 1927
2,791,424	Noon	May 7, 1957
2,819,075	Noon	Jan. 7, 1958
2,819,076	Wendt et al.	Jan. 7, 1958
2,905,466	Azari et al.	Sept. 22, 1959
2,953,371	Smith	Sept. 20, 1960