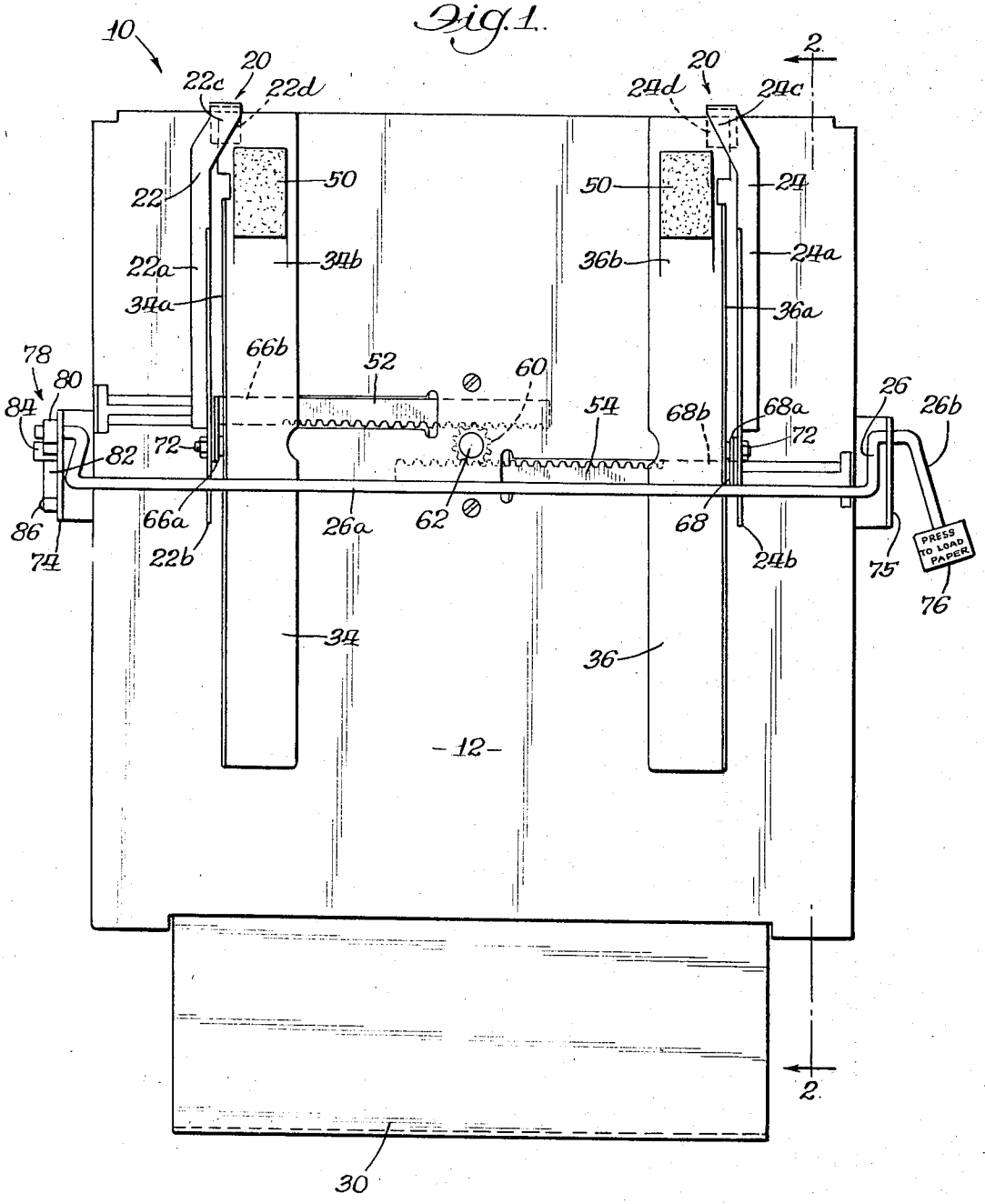
Feb. 20, 1968 J. J. SCHULZE ETAL 3,369,804

SHEET FEEDING APPARATUS

Filed Nov. 26, 1965 2 Sheets-Sheet 1

Fig. 1.




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SHEET FEEDING APPARATUS

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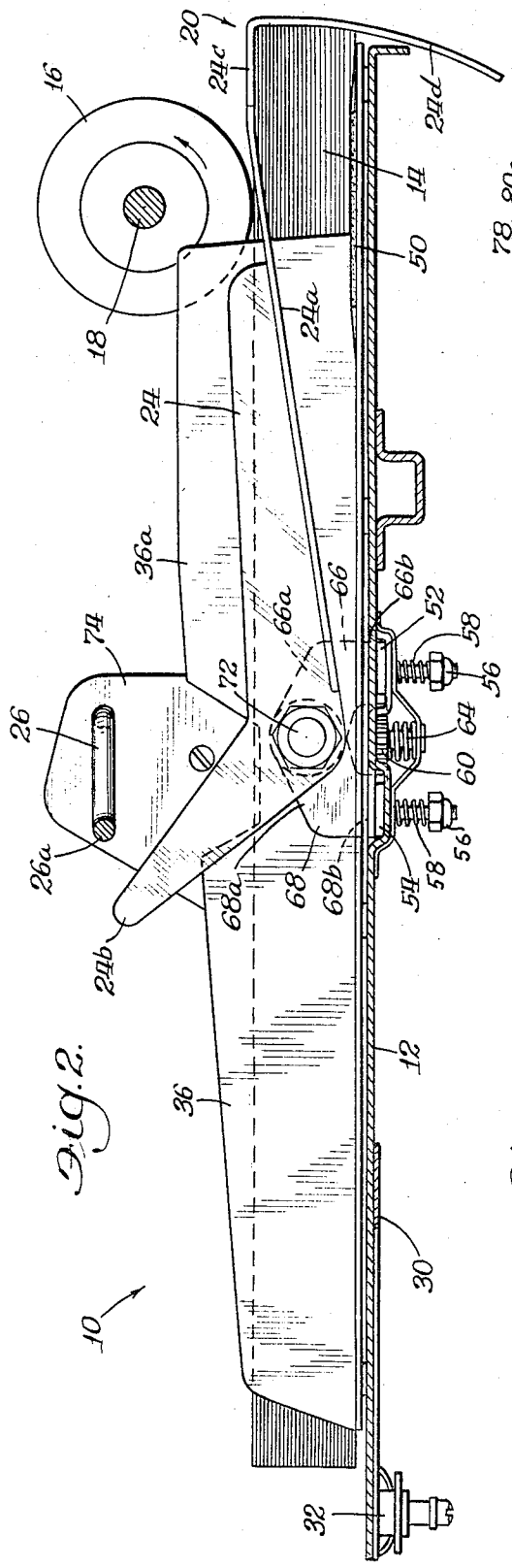



Fig. 2.

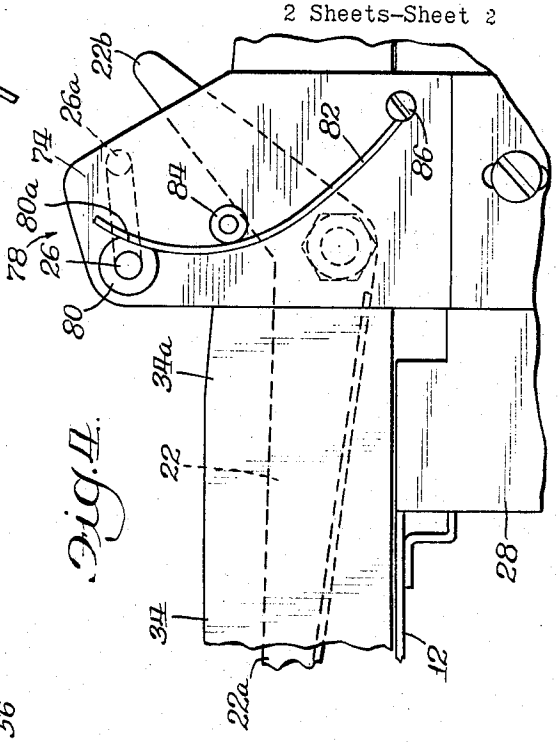



Fig. 4.

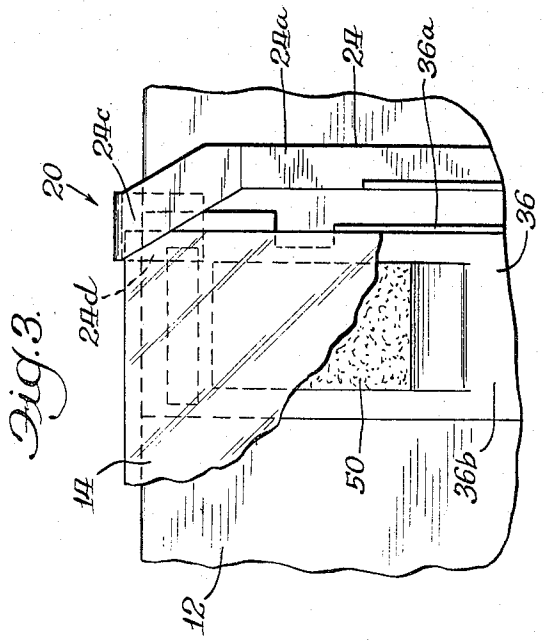



Fig. 3.

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3,369,804

# SHEET FEEDING APPARATUS

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## ABSTRACT OF THE DISCLOSURE

A tray supports a stack of sheets to be fed one by one by drive rollers. A pair of conjointly movable edge guides engage the sides of the stack. A pair of separator arms pivot freely above the tray on supports movable with and spaced to the side of the edge guides, each arm including a forwardly extending segment spaced to the side of the stack, an inwardly veering segment resting on the front corner of the stack and a downwardly extending segment abutting the front of the stack. An eccentric bail above the tray is normally held in a neutral position by a resilient latch and is manually movable to an operating position to engage upwardly and rearwardly extending segments of the arms to lift the arms from the stack. The latch frictionally holds the bail and arms in the raised position.

The present invention relates to sheet feeding apparatus, and more particularly to improved sheet separating apparatus for separating individual sheets serially fed from a stack of sheets.

Devices for automatically feeding single sheets from a stack receiving tray into various types of copying apparatus are known. Such sheet feeding devices include sheet driving means, such as a pair of rollers, mounted on an intermittently driven shaft and resting on the top sheet of the stack for feeding the top sheet of the stack in a given direction.

Since the top sheet may tend to adhere to one or more lower sheets of the stack, sheet feeding devices frequently include means for separating the top sheet from the stack as it is fed so that only a single sheet is fed into the machine. Known sheet separating apparatus includes an abutment for the leading edge of the stack and also an abutment engaging the upper surface of the top sheet adjacent the leading edge. Thus when the top sheet is fed it is forced to flex away from the lower sheets until it snaps clear of the abutments. Known devices also include apparatus for disengaging the sheet feeding means in order to clear the stack when it is desired to change or add sheets.

Known sheet separating devices are unsatisfactory for several reasons. Often the apparatus including the sheet engaging abutments is inconveniently located with respect to the stack receiving tray, whereby installation, adjustment and repair are hindered. Furthermore, unnecessarily complex arrangements are used for mounting and positioning the sheet separating devices. In addition, the apparatus known heretofore for disengaging the sheet separating means is complicated and inconveniently located in the machine.

Accordingly, it is an object of the invention to provide improved sheet feeding apparatus including novel means for separating individual sheets characterized by being simple and compact in construction and capable of easily being installed and adjusted and capable of economically being manufactured.

It is another object to provide improved sheet separating apparatus capable of automatically being adjusted for sheets of various widths.

It is yet another object of the present invention to provide sheet feeding apparatus including a simple and positive arrangement for disengaging the sheet separating apparatus to clear the stack when desired.



In accordance with these and many other objects, sheet feeding apparatus embodying the present invention may comprise a sheet supporting tray adapted to receive a stack of sheets to be fed one at a time from the stack in a given direction. A pair of side rails are mounted on the tray for simultaneous conjoint movement to accommodate sheets of various widths and sheet driving means such as shaft driven rollers rest on the top sheet and, when rotated, propel the top sheet away from the stack.

In order to free the top sheet from the remaining sheets in the stack, the apparatus includes sheet separating means comprising a pair of pivotally mounted sheet separating arms, one mounted at each side of the stack of sheets. Each arm is mounted on a support extending upwardly from the tray, and thus pivots about a point above the tray. Each arm includes a portion extending forwardly from the support, and these portions are provided with segments normally resting upon the top sheet of the stack, one at each leading corner. The arms also include portions extending from the sheet engaging segments downwardly along the front end of the stack.

The side rails are mounted on a pair of rack elements so that they move simultaneously and conjointly on the tray to receive stacks of sheets of different sizes. In order that the sheet separating arms always are in the proper position for stacks of various widths, the supports on which the arms are mounted are also fixed to the rack elements, and thus are automatically moved to the proper position when the side rails are adjusted. The arms do not obstruct the side rails or the stack of sheets, since they are mounted on their own supports and not on the side rails.

In order to disengage the sheet engaging segments of the sheet separating arms from the stack when it is desired to add or change sheets, an eccentric operator or bail is mounted above the stack and includes a handle whereby it may be manually rotated. The sheet separating arms include portions extending upwardly from the supports, and when the eccentric operator is rotated, it engages these upwardly extending portions and pivots the sheet separating arms whereby the sheet engaging segments are lifted away from the stack of sheets. In addition, a latching mechanism is provided for releasably holding the eccentric operator in an inactive position spaced from the sheet separating arms.

Many other objects and advantages of the present invention will become apparent from considering the following detailed description in conjunction with the drawings in which:

FIG. 1 is a top elevational view of sheet feeding apparatus embodying the present invention;

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1 illustrating the sheet feeding apparatus of FIG. 1 and also illustrating sheet driving means and a stack of sheets to be fed;

FIG. 3 is an enlarged partial elevational view, partly in section, of a portion of the apparatus of FIG. 1; and

FIG. 4 is an enlarged partial view of another portion of the apparatus of FIG. 1.

Having reference now to the drawings and initially to FIG. 1, there is illustrated sheet feeding apparatus embodying the features of the present invention and designated as **10**. The sheet feeding apparatus **10** includes a uniplanar tray **12** adapted to receive a stack **14** (FIGS. 2 and 3) of sheets to be fed one by one from the tray into a utilization device, which may be a reproducing or copying machine (not shown). Driving means including one or more rollers **16** mounted upon an intermittently rotated shaft **18** (FIG. 2) serve to propel the sheets from the stack

14 toward the utilization device—i.e., to the right as viewed in FIG. 2.

In order to separate individual sheets from the stack as they are fed, the apparatus 10 includes sheet separating means generally designated as 20. The sheet separating means includes a pair of sheet separating arms 22 and 24 located above the tray 12 and positioned one at either side of the stack 14. Additionally, means including an eccentric operator 26 are provided for disengaging the sheet separating means 20 in order to free the stack 14 when it is desired to add or change sheets.

Referring now to the construction of the tray 12, it comprises a rigid horizontally oriented member supported by means of supporting plates 28 connected to the sides of the tray 12, one of which is illustrated in FIG. 4. When the sheet feeding apparatus 10 is used in conjunction with a duplicating or copying machine, the supporting structure 28 may comprise a portion of the framework or casing of the duplicating or copying machine, as will be understood by those skilled in the art. In order that the tray 12 may accommodate sheets having a length greater than that of the tray, an extendable shelf 30 is slidably mounted beneath the tray 12 by means of suitable fastening structure 32 (FIG. 2).

In order properly to position and to center the sheets of the stack 14 on the tray 12, a pair of side rails or edge guides 34 and 36 are carried upon the tray 12. These side rails include vertically disposed portions 34*a* and 36*a* adapted to engage the two sides of the stack 14. Horizontally disposed portions 34*b* and 36*b* rest upon the surface of the tray 12, and each has a friction pad 50 disposed near its forward end.

In order that the side rails 34 and 36 move simultaneously and conjointly—i.e., together and apart at the same time—the horizontally disposed portions 34*b* and 36*b* are secured to a pair of rack elements 52 and 54 which are slidably held in place in grooves running transversely across the tray 12 by means of fasteners 56 and springs 58 (FIG. 2). The two rack elements 52 and 54 are constrained to move together by means of a pinion 60 simultaneously engaging the teeth of both rack elements as shown in dotted lines in FIG. 1. In order independently to adjust the side rails 34 and 36, the pinion may be depressed by means of a button 62 against a spring 64 whereby the rack elements are freed for independent movement. Normally, however, the rack elements are constrained to move together and the side rails may be automatically adjusted to accommodate sheets of any width.

In accordance with a feature of the invention, the sheet separating arms 22 and 24 are pivotally mounted on a pair of supports 66 and 68 including vertically disposed portions 66*a* and 68*a* extending upwardly from the tray 12. In addition, horizontal portions 66*b* and 68*b* extend beneath the horizontal portions 34*b* and 36*b* of the side rails 34 and 36, and are fastened to the rack elements 52 and 54. Thus, it can be seen that when the rack elements 52 and 54 are simultaneously and conjointly moved in order to adjust the side rails for sheets of various widths, the sheet separating arms 22 and 24 are likewise automatically adjusted.

In addition, the arms are pivotally mounted on the supports 66 and 68 by means of fasteners 72 and are not directly fastened to the side rails. Thus, the fasteners 72 do not obstruct or interrupt the smooth guiding surface of the side rails 34 and 36, or interfere in any way with the feeding of sheets from the stack 14.

The sheet separating arms 22 and 24 are economically formed from single sheets of material, such as metal, by means of a few very simple stamping and bending operations. The arms include forwardly extending portions 22*a* and 24*a* serving to separate the sheets as they are fed, as well as upwardly and rearwardly extending portions 22*b* and 24*b* which aid in disengaging the sheet separating apparatus, as explained hereinafter. Conveniently, the portions 22*a*, 24*a*, 22*b* and 24*b* of the arms are disposed to the sides of the stack 14 and outside of the side rails 34 and 36. Thus, the arms 22 and 24, although easily accessible above the tray 12, do not obstruct the stack 14 or the side rails.

Near the forward ends of the arms 22 and 24 are inwardly veering segments 22*c* and 24*c* which extend over the top surface of the top sheet, one at each leading corner, and rest upon the top sheet. Downwardly extending portions 22*d* and 24*d* form abutments for the front of the stack of sheets. The portions 22*d* and 24*d* are slightly curved in order that they present a similar configuration to the front of the stack regardless of the angular position of the arms 22 and 24.

When a sheet is fed by means of the rollers 16 from the top of the stack 14, the segments 22*c* and 24*c* and the portions 22*d* and 24*d* cause the top sheet initially to flex away from the lower sheets. When the top sheet flexes sufficiently, it snaps over the arms and is fed away from the stack 14 over the segments 22*c* and 24*c*.

Whenever it is desired to add or change sheets of the stack 14, it is necessary to disengage the sheet separating arms 22 and 24 from the stack. This is accomplished in accordance with the present invention by means of the eccentric operator 26 which is mounted above the stack 14 and approximately over the supports 52 and 54, extending transversely across the tray 12. The operator 26 comprises a shaft or bail mounted for rotation in a spaced pair of mounting brackets 74 and 75 located at the sides of the tray 12. The operator 26 includes an eccentric portion 26*a* normally spaced from the arms 22 and 24, as illustrated in the drawings. One end of the operator includes a portion 26*b* adapted to be conveniently accessible to the user and provided with a handle 76. When the handle 76 is depressed, the eccentric portion 26*a* is moved into engagement with the upwardly and rearwardly extending portions 22*b* and 24*b* of the arms 22 and 24, whereby the arms are rotated in a counterclockwise direction as viewed in FIG. 2 and whereby the segments 22*c* and 24*c* are lifted away from the stack 14.

In order releaseably to hold the operator 26 in a neutral position spaced from the arms 22 and 24, a latching mechanism generally designated as 78 is provided. The latching mechanism 78 includes a knob 80 fixed to the end of the operator 26 opposite the handle 76. A resilient member 82 is held in tension between the knob 80, a roller 84, and a screw 86, all of which are positioned immediately adjacent one of the mounting brackets 74 (FIG. 4), The knob 80 is provided with a flat 80*a* engaged by the resilient member 82 in the illustrated neutral position of the operator 26. The force exerted by the resilient member 82 against the flat 80*a* of the knob 80 is effective to hold the operator 26 in a neutral position. However, when the operator 26 is rotated from the neutral position, the latching mechanism 78 does not significantly oppose the manual rotation of the operator 26 and does not urge the operator back to the neutral position. Rather, the friction induced by the member 82 holds the operator 26 in any position. Thus, once the eccentric operator 26 has been moved to the position in which it disengages the sheet separating arms 22 and 24 from the stack 14, the user of the apparatus may use two hands for manipulating the stack 14, since he is not required to maintain pressure on the handle 76.

Thus is can be seen that in accordance with the present invention a very simple arrangement is provided for separating the individual sheets and additionally for manipulating the separating means to clear the stack 14. The arms 22 and 24 are of economical unitary construction, and no structure other than the bail 26 is needed to disengage the arms. Furthermore the arms and the bail 26 are conveniently accessible above the tray, and can thus easily be installed on new or on previously constructed machines.

Although the present invention has been described with

reference to a single embodiment thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of the present invention.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. Apparatus for feeding individual sheets from a stack by movement in a given direction, said apparatus comprising:

a sheet supporting tray adapted to receive a stack of sheets;

a pair of sheet edge guides mounted for lateral movement of said tray;

a guide moving assembly mounted on said tray and connected to said edge quides for effecting simultaneous and conjoint opposed lateral movement of said edge guides into engagement with the sides of a stack of sheets placed on said tray;

a pair of support members extending upwardly from said tray and mounted on said guide moving assembly for simultaneous movement with said edge guides, each support member being laterally spaced to the outside of one of said edge guides;

a pair of separator arms each mounted for pivotal movement about a pivot point on one of said support members and each including a first segment extending forwardly from the pivot point alongside of and spaced to the side of the stack of sheets;

each separator arm including a second, inwardly veering segment extending toward and normally resting upon the leading corner of the uppermost sheet of the stack, and a third downwardly extending segment forming an abutment for the front of the stack of sheets;



each separator arm also including a fourth segment extending upwardly and rearwardly from said pivot point to a region above the stack of sheets;

and manually operable means disposed above said stack of sheets and engageable with said fourth segments of said separator arms for pivoting said arms to lift said third segments of said arms from said stack of sheets.

2. The apparatus of claim 1, a pair of mounting brackets on opposite sides of said tray, said manually operable means comprising an operator member disposed above the stack of sheets and mounted in said mounting brackets for rotation between a neutral position and an operating position, said operator member having an eccentric portion spaced from the fourth segments of said separator arms in said neutral position and engaging said fourth segments to lift said separator arms in said operating position, latch means on said operator member having adjacent flat and curved surfaces, and resilient means engaging said flat surface in the neutral position of said operator member to releasably latch said operator member in the neutral position, said resilient means frictionally engaging said curved surface in the operating position of said operator member with sufficient force to hold said separator arms in the raised position.

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