Nov. 11, 1969 A. SCHWEBEL 3,477,324

DEVICE FOR CONTINUALLY WITHDRAWING SINGLE SHEETS FROM A STACK OF SHEETS

Filed July 11, 1967 2 Sheets-Sheet 1

Fig.1

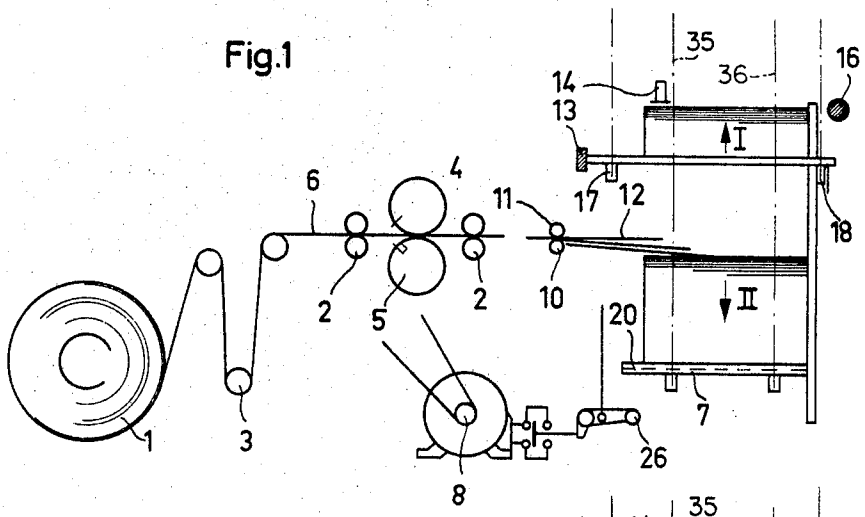


Fig.2

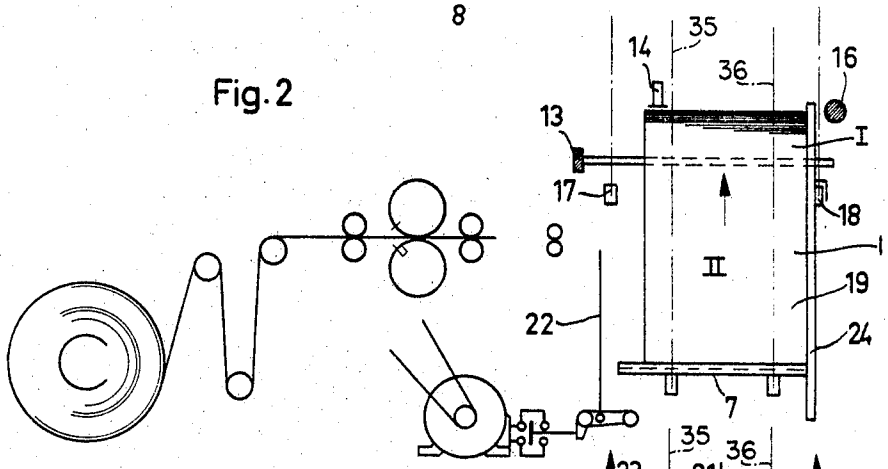
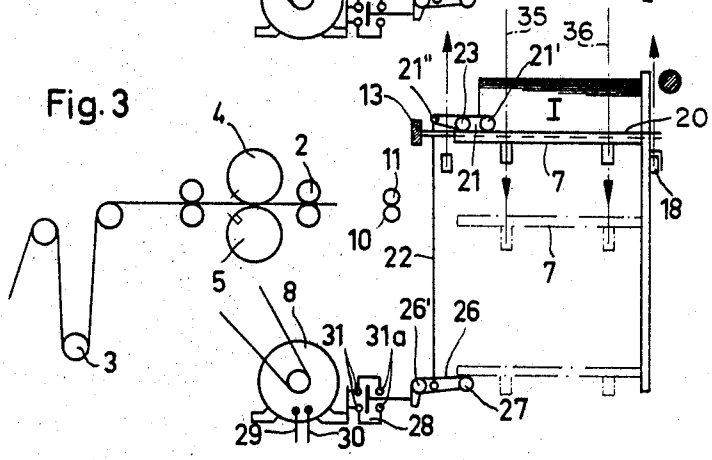


Fig.3



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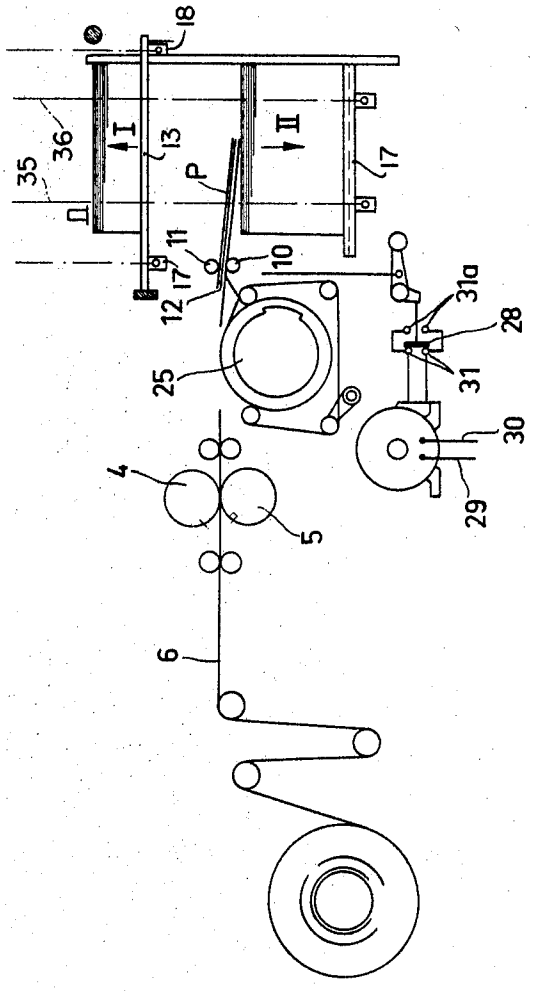


Fig.4

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DEVICE FOR CONTINUALLY WITHDRAWING SINGLE SHEETS FROM A STACK OF SHEETS

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Int. Cl. B65h 35/04
U.S. Cl. 83—79 6 Claims

ABSTRACT OF THE DISCLOSURE

There is shown a device for continually withdrawing single sheets from a stack of sheets. The device provides an upper stack of sheets from which sheets are successively withdrawn one by one for transport to a point of utilization and a lower stack to the top surface of which sheets, having been cut, are fed and which is combined with the upper stack to a single stack by lifting the lower stack into engagement with the bottom of the upper stack when the lower stack is built up to a predetermined height.

The invention relates to a device for continually withdrawning one by one sheets from the top side of a stack of sheets and for replenishing the stack by feeding sheets to the bottom side thereof delivered to the stack by a sheet cutting and feeding device.

The development of high speed printing and other sheet using devices, has resulted in a marked and rapid increase in the output and the quality of the finished products.

It was heretofore possible to supply the required large quantity of sheets to modern high speed machines only by using the so-called non-stop sheet feeders. Such sheet feeders are equipped with continually controlled sheet feeding means and stack feeding devices and also with several lifting means for the stacks. These lifting means have main lifting means for lifting a second or replacement stack and an auxiliary lifting means is used to effect lifting of the first stack from which sheets are withdrawn.

Due to the general increase of the costs of sheet material and also due to the fact that the transport of stacks of sheets requires a more complicated equipment and is far more expensive than the transport of rolls of sheet material, the use of rolled sheet material has continuously increased during recent years.

There is known a device in which the stack of sheets is continuously replenished by means of a paper cutting and feeding device. The cut sheets are successively slid beneath the bottom side of the stack. A device of this kind has several disadvantages. The control of the top level of the stack and a smooth feeding of the sheets to the bottom of the stack are difficult to accomplish. It is virtually impossible to feed thin paper sheets or synthetic foils which tend to accumulate an electrostatic charge to the bottom side of the stack. Hence, such thin paper or foil cannot be used in the aforementioned known device.

It is a broad object of the invention to provide a novel and improved device for continually singling sheets in which new stacks of sheets are supplied to the device when needed by means of conventional non-stop sheet feeders of the type previously referred to without interruption of the working cycle.

The aforementioned object, feature and advantage and other objects, features and advantages which will be pointed out hereinafter are obtained by providing a device in which single sheets are continually withdrawn from the top side of an upper stack of sheets and the level for feeding

sheets to a lower stack is above the top level of the lower stack. The lower stack when reaching a predetermined height is combined from below with the upper stack by lifting the lower stack to a level such that its top surface constitutes a support for the upper stack.

In the accompanying drawing several preferred embodiments of the invention are shown by way of illustration and not by way of limitation.

In the drawing:

FIG. 1 is a diagrammatic elevational side view of a device according to the invention, a partly depleted upper or first stack and a lower or second stack being shown separated from each other;

FIG. 2 is a diagrammatic elevational view similar to FIG. 1 but showing the partly depleted first stack and the second stack combined with each other;

FIG. 3 is a more detailed elevational view of the device according to FIGS. 1 and 2 showing an intermediate operational step of the build-up of the second stack for replenishing the partly depleted first stack; and

FIG. 4 is a diagrammatic elevational side view of a modification of the device according to the invention.

Referring first to FIGS. 1, 2 and 3 more in detail, there is shown a roll **1** of paper from which a web **6** is continually withdrawn in a conventional manner by means of drive and guide rollers **2** and idlers **3**. The web is guided to a cutter shown in the form of a cutting roller **4** and a counter roller **5**. The cutter cuts the web transversely into individual sheets **12** of desired length. The sheets are fed one by one by feed means in the form of two coacting rollers **10** and **11** to the top side of a reserve or lower stack II resting upon a main stack table **7** of conventional design. The table and with it the sheets thereon can be lowered and lifted by conventional reversible lifting means as is indicated. A motor **8** for driving cutter **4**, **5** and the power drive (not shown) for the lifting means of table **7** should be visualized as being connected to a conventional circuit control assembly so that when motor **8** is started table **7** is stepwise or gradually lowered. As is evident, stack II of sheets **12** is being gradually built up on table **7**. A back stop **24** and lateral stops (not shown) align the sheets **12** fed upon the top surface of stack II.

The device further comprises an auxiliary or second table in the form of support bars **13** removably insertable in grooves in the top side of table **7** conventionally provided in this table as indicated at **20**. The auxiliary table formed by bars **13** can be lifted or lowered independent of table **7** by auxiliary reversible lifting means indicated at **17** and **18**. There is shown diagrammatically at **18** a switch. One contact of this switch may be formed by making lifting member **18** electrically conductive and the other contact by an angular switch arm indicated above member **18**. The angular arm may either occupy a position in contact engagement with member **18** as is shown in FIG. 1, or be disengaged therefrom as is shown in FIG. 2. The switch is biased into the open position of FIG. 2 and is forced into the closed position of FIG. 1 by the weight of support bars **13** and of paper resting thereupon. The paper sheets resting on bars **13** constitute an upper stack designated by I.

Conventional withdrawal means indicated by a suction cup **14** and a roller **16** withdraw sheets one by one from the top surface of stack I thereby gradually depleting the stack. The stack is gradually lifted by lifting means **17**, **18** via bars **13** to compensate for the withdrawal of sheets from the top side of the stack. The rate of withdrawal of sheets from stack I is preferably lower than the rate of cutting sheets by the cutter **4**, **5** and feeding the same to the top side of stock II.

When stack II has reached a predetermined height, its table **7** is lowered by lifting means **35**, **36** to a level

at which it engages and operates a limit switch **26** as will be more fully described hereinafter. Operation of switch **26** stops drive motor **8** for cutter **4, 5** and also reverses the lifting means **35, 36** for table **7** so that the table and with it stack II are now lifted.

As is evident from FIG. 2, stack II being disposed below the more or less depleted upper stack I will be gradually lifted to a position in which the upper stack I or more specifically the support bars **13** therefor come to rest upon the top surface of stack II. When now the support bars are withdrawn the two stacks I and II shown separately in FIG. 1 are combined to a single stack as is shown in FIG. 2. This new single stack now becomes stack I, that is, the stack from which sheets are withdrawn as previously described. As is also evident, the withdrawal of sheets from the upper stack need not to be interrupted when and while the lower stack is being moved upwardly.

The lower stack II when it reaches, during its upward movement, support bars **13**, relieves auxiliary lifting means **17** and **18** of the weight of the bars and the remainder of the stack resting thereupon. FIG. 2 shows support bars lifted above auxiliary lifting means **17** and **18**. Accordingly, the switch formed at lifting member **18** opens and such opening of the switch is used to stop the further upward movement of table **7**. The support bars **13** are now reinserted in the grooves **20** of table **7**.

By a suitable and conventional control system which may be operated manually for instance by push buttons or automatically, auxiliary lifting means **17** and **18** are now lowered into engagement with bars **13** which now support the weight of the combined stack. As a result, the switch at member **18** is reclosed thereby causing restarting of motor **8** and thus of cutter **4, 5** and also starting of the lifting means for lowering table **7**. A new working cycle now begins.

Reverting now to the operation of switch **26**. Switch **26** comprises a switch arm **21** which is pivotal about a pivot axis **21'** disposed outside of the path of movement of table **7**. A roller **23** is secured to arm **21** intermediate the length thereof. The roller is located in the path of movement of table **7**. The free end **21''** of the arm is linked by a suitable transmission **22** to one arm of a bell crank lever which is pivotal about a pivot **26'**. The one arm of the bell crank lever mounts a roller **27** disposed in the path of movement of table **7**. The other arm of the lever mounts a contact bar **28** movable from the inactive position shown in FIG. 3 into engagement with either one of two pairs of contacts **31** and contacts **31*a*** thereby connecting motor **8** to a source of current indicated by wires **29** and **30**.

As stated before, upper stack I (see FIG. 3) is being continuously depleted when the device is in operation and while being so depleted is gradually lifted. When the stack has reached the state of depletion shown in FIG. 3, roller **23** is engaged and lifted. As a result, table **7** starts its downward movement, the stack itself which now embodies the stacks I and II of FIG. 1 being supported by bars **13** which, in turn, are supported by lifting means **17, 18**. The cutter **4, 5** and feed means **10, 11** are started for feeding sheets upon table **7**. This operation continues until table **7** again reaches its lower end position in which roller **27** is engaged by the table thereby reversing the movement of table **7** and starting the cutter as previously described when the table is level with the feed rollers **10, 11** as is indicated in FIG. 3.

A complete operational cycle of the device is as follows:

Let it be assumed that support bars **13** constituting the auxiliary table of the device are inserted into grooves **20** provided in the top side of main table **7** and that a stack (*I+II*) of sheets resting on bars **13** and thus supported by the main table has a height such that its top level is in coacting relationship with sheet withdrawal suction cup **14**. Table **7** and with it the stack are lifted

by lifting means **35, 36** in accordance with the rate of withdrawal of sheets from the stack until the same is depleted to a selected level. Bars **13** are now placed in engaging relationship with lifting means **17, 18**, as is indicated in FIG. 1 and table **7** with the stack II thereon is lowered, as is also shown in FIG. 1. While table **7** is being lowered lifting means **17** and **18** lift the bars and thus the sheet stack I thereon for continued withdrawal of sheets by cup **14**.

During the lowering of table **7** the stack of sheets thereon is replenished by sheet cutting and feeding means **4, 5, 10** and **11**, as previously described. When table **7** reaches its lowermost position, switch **26** is operated and reverses the downward movement of table **7**. As table **7** moves upwardly the top level of the sheets thereon will eventually engage bars **13**. As a result, the bars and the sheets thereon are lifted clear of lifting means **17** and **18**, as it is shown in FIG. 2. When now the bars are pulled out, stack II on table **7** and the stack I supported by the bars are combined to a single stack.

The operational cycle is now completed. The bars can be reinserted into grooves **20**, thereby preparing the device for a new cycle.

The device of FIG. 4 will be generally clear from the previous description. It is distinguished from the previously described device in that the feeding of single sheets **12** by means of rollers **10, 11** upon the top surface of stack II is replaced by a collector **25** or feeding packages P of sheets. Such collectors are well known in the art. They are described for instance, in German Patent 1,210,315 and British Patent 972,407. Collectors of this kind which do not constitute part of the invention, form packages which contain a desired number of sheets and are fed as units. The use of collectors in the device according to the invention has the advantage that the lifting means and the components associated therewith can be operated at a lower speed then when sheets are fed singly.

While the invention has been described in detail with respect to certain now preferred examples and embodiments of the invention, it will be understood by those skilled in the art, after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A device for withdrawing sheets, one by one, from either one of two stacks of sheets, said device comprising in combination:

a main stack table for supporting a first stack of sheets;

an auxiliary stack table for supporting a second stack of sheets disposed above the main table, said auxiliary stack table being insertable between said main table and sheets supported thereby;

first reversible lifting means for lifting and lowering respectively said main table;

second reversible lifting means engageable with said auxiliary table for supporting the auxiliary table and for lifting and lowering respectively the same independent of the main table;

sheet separating means for successively withdrawing single sheets from the top surface of either stack;

sheet cutting and feeding means for cutting rolled sheet material into individual sheets and feeding the cut sheets to the main table while the same is moving toward a lowermost position; and

control means for controlling said first and second lifting means:

(a) to activate the first lifting means for lifting the main table with the first and the second stack combined thereon and the auxiliary table inserted between the main table and the bottom sheet thereon, at a rate corresponding to the drawal of sheets from the top surface of the stack;

(b) to activate the first lifting means for lowering

the main table and the sheets thereon toward said lowermost position when the combined stack on the main table is depleted below a selected height, the sheets remaining on the auxiliary table constituting the second stack and the sheets on the main table constituting the first stack;

(c) to activate the second lifting means for lifting the auxiliary table together with the second stack at the rate of withdrawal of sheets from the top of said stack;

(d) to activate the sheet cutting and feeding means for feeding cut sheets to the main table while the same is being lowered into said lowermost position;

(e) to reactivate the first lifting means for lifting the main table until the first stack thereon engages said auxiliary table from below thereby causing lifting of the auxiliary table together with the second stack thereon, said lifting of the auxiliary table by the first stack deactivating the second lifting means whereby upon withdrawal of the auxiliary table both stacks are combined.

2. A device according to claim **1** wherein said control means comprise switch means actuated by the main table reaching said predetermined lowermost position, actuation of said switch means causing stoppage of said cutting and feeding means and activation of the first lifting means to effect lifting of the main table.

3. A device according to claim **2** wherein said control

means comprise further switch means for activating the first lifting means for lowering the main table from the position in which the stacks are joined from below toward its lowermost position, said second switch means being operated by the upward pressure upon said auxiliary table due to the lifting of the main stack into abutment with the bottom of the second stack, said second switch means further restarting said cutting and feeding means when the second table is lowered to the level thereof.

4. A device according to claim **1** wherein said cutting and feeding means feeds sheets upon the first stack at a lower rate than the withdrawal means withdraws sheets from the top surface of the second stack.

5. A device according to claim **1** wherein said cutting and feeding means comprises a sheet collector collecting cut sheets in packages and feeding said packages as units upon the top surface of the first stack.

6. A device according to claim **1** wherein said auxiliary table comprises a plurality of support bars movably insertable into grooves in the top side of said main table.

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FRANK T. YOST, Primary Examiner

U.S. Cl. X.R.

83—89, 92; 271—62, 88