United States Patent

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[54] **SHEET COUNTER AND TAB INSERTER**
5 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **93/93**
[51] **Int. Cl.** **B65h 33/04**
[50] **Field of Search** 93/93.1

[56] **References Cited**

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2,570,306	10/1951	Battersby	93/93(1)
2,629,300	2/1953	Smith	93/93(1)
2,666,372	1/1954	Lauffer	93/93(1)
2,795,172	6/1957	Hanson	93/93(1)
2,837,016	6/1958	Jeziersky	93/93(1)

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ABSTRACT: Apparatus for placing markers such as paper tabs between stacked articles to segregate them into counted groups and more specifically an improved portable sheet counter and tab inserter for automatically counting and dividing stacks of paper sheets into counted groups by placing a strip of paper atop the stack and then cutting the strip to form a tab whereby the length of the tab is precise and readily adjustable and the time delay between the placing of the strip and the cutting of the strip to form the tab can be simply and easily altered.

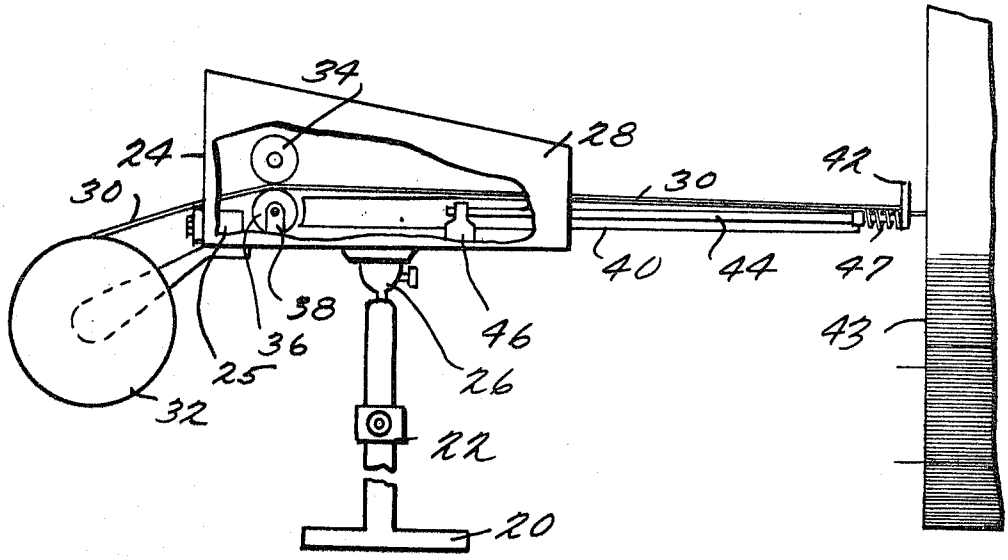


Fig. 1.

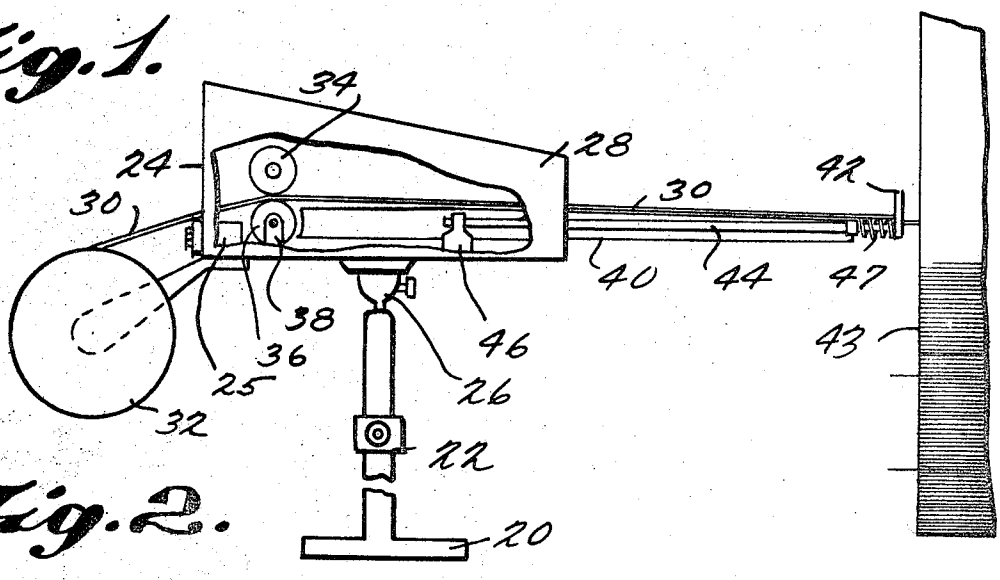


Fig. 2.

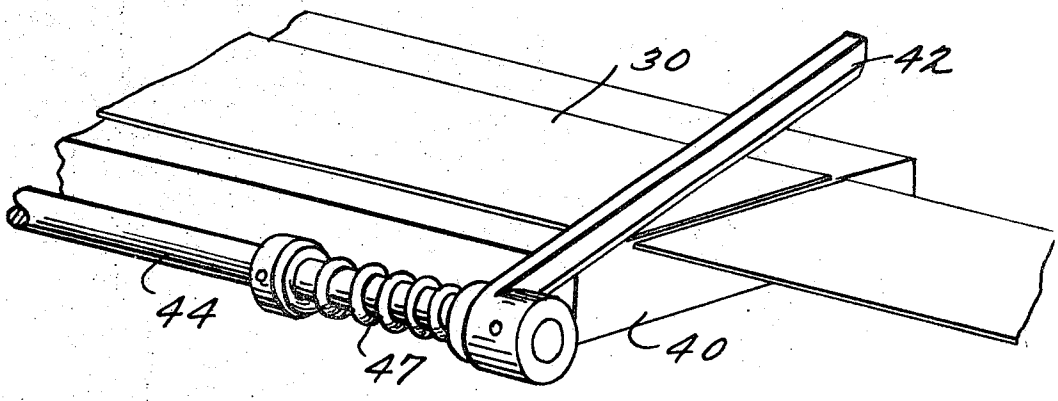
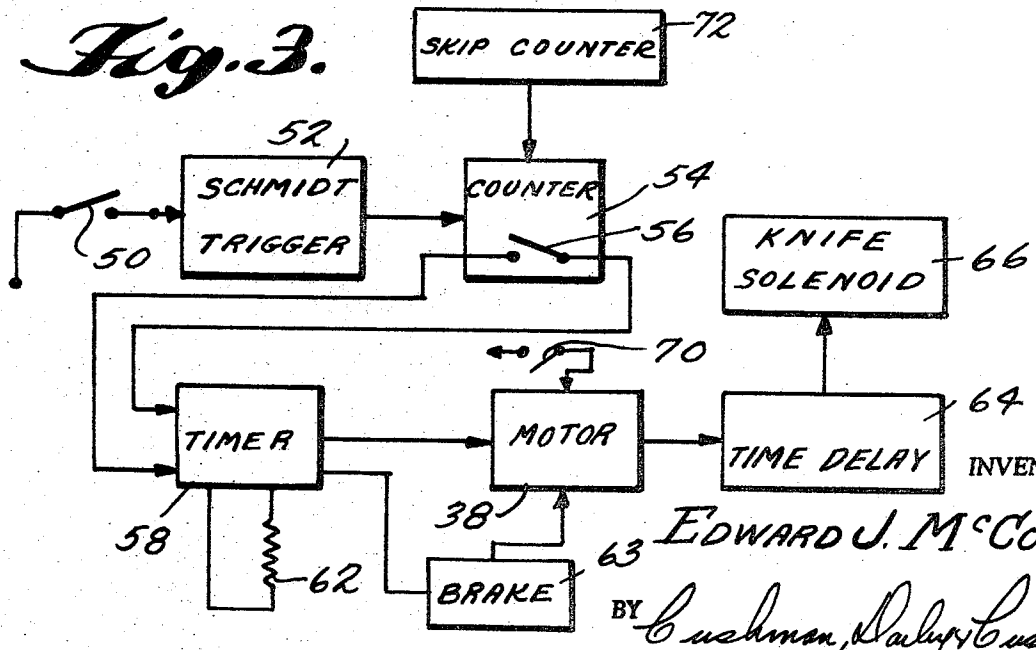


Fig. 3.



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SHEET COUNTER AND TAB INSERTER

DESCRIPTION OF THE PRIOR ART AND SUMMARY OF THE INVENTION

In many industries it is desirable to count articles which are being stacked and to divide them into groups having a given number of articles for subsequent disposal. This need is especially applicable to sheets of paper delivered individually to a pile from a printing press or other sheet handling devices. In order to divide such sheets into groups having equal numbers of sheets so as to facilitate counting, packaging, etc. it has been common practice to count the sheets as they are being stacked and to place marking tabs such as small slips of paper on the uppermost sheet of a counted group so that each tab is partially covered and held in place by sheets placed atop it but remains in an overhanging position along an edge of the pile to provide a physical and visual determination of the counted groups.

One method of accomplishing this grouping is to manually count the sheets as they are placed on the stack and then to manually insert a paper tab or other marker at a given count. However, besides being inefficient and expensive, the speed of many printing presses and similar devices makes accurate counting difficult. Furthermore, manual handling of freshly printed material may result in considerable spoilage.

Several different types of automatic counters and tab inserters have been developed and utilized in the prior art. Many of these devices are portable and adaptable for use with a variety of types and sizes of sheets of paper and other articles and have gained wide acceptance and use. One such automatic sheet counter and tab inserter is fully described in Lauffer U.S. Pat. No. 2,666,372 issued Jan. 19, 1954.

However, such prior art devices such as the device disclosed in the aforementioned Lauffer patent have a number of disadvantages. For example, with the Lauffer device it is difficult to control the precise length of the tab being inserted and even more difficult to change that length. When a tab is to be inserted into the stack, the Lauffer device activates a solenoid which then pulls a rack, engaging a piston through a clutch which in turn drives a feed roller. A continuous strip of paper from a roll wound on a reel mounted on the device is threaded between the driver roller and a second passive roller so that the rotation of the driven roller advances the strip of paper, by unwinding the reel, into a position atop the last and uppermost sheet in a given group. The strip of paper is than subsequently cut to leave a tab between the sheets.

The advance of the paper strip and hence the length of the tab is then primarily determined by the amount of overtravel of the driven roller and the friction of the paper strip. Since this friction varies with the amount of paper remaining on the roll, the type of paper, as well as several other variables, the length of the tab inserted tends to also vary as the roll of paper unwinds and as other variables change. Furthermore, in the Lauffer device the length of the tab inserted cannot be manually adjusted without great difficulty.

In contrast, the improved device of the present invention utilizes a motor to drive a similar roller to advance the paper strip directly onto the stack. The operating time of the motor determines the length of the tab inserted and can be determined by an adjustable electronic circuit or other suitable means. Thus, the advance of the paper strip and hence the tab length can be very precisely determined in advance and simply altered as desired by varying the time during which the motor drives the roller.

In the aforementioned Lauffer patent the paper strip is cut leaving a tab between the proper sheets by the action of a knife solenoid after the strip has been suitably advanced and covered by a number of sheets. The time between the feeding of the paper strip onto the pile and the operation of the cutoff mechanism which determines how many sheets of paper are stacked on top of the tab before the strip is cut is determined by attaching a lead to one of a few positions on a stepping switch inside the casing. This time then can be altered only by dismantling the apparatus and attaching the lead to a different position.

The improved device of the present invention allows this time interval between the insertion of the tab and the cutting of the paper strip to be precisely set at any given value and changed at will. This flexibility then allows the cutting action to occur after any given number of sheets have fallen atop of the strip. Since the number of sheets necessary to retain the tab in the stack varies with the type of paper, the size of the tab and other variables this ability to adjust this time interval improves the ability of the device to operate in any situation.

In addition, in the embodiment described below, the improved device of the present invention connects the actual counting switch, such as a microswitch located on the arm of the printing press first to a Schmidt Trigger circuit which is then connected to the counter. This arrangement ensures that only one pulse will be produced for each closing of the microswitch even if the microswitch should remain closed due to machine failure or the like.

Furthermore, the improvements incorporated into the device of the present invention make the device easier to load with a new roll of paper than other prior art devices. A feed button or switch located on the front of the device causes the feed motor to drive the roller continuously when operated so that the end of the paper strip can be manually placed between the rollers and then automatically advanced completely through the device until the end passes the cutoff knife. When the button or switch is then released the knife operates and the device is then prepared to begin counting and inserting tabs. A tab can be inserted into the stack at any time without disturbing the count by using a feed button or switch to cause the motor to advance the strip of paper.

Other objects and purposes of the invention will become clear after reading the following detailed description of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the improved sheet counter and tab inserter;

FIG. 2 shows the knife blade for cutting the paper strip; and

FIG. 3 shows a block diagram of the circuitry for controlling the tab insertion and paper cutting operations.

DETAILED DESCRIPTION OF THE DRAWINGS

Reference is now made to FIG. 1 which shows one embodiment of the improved automatic sheet counter and tab inserter of the present invention. This device can be used with any type of production paper or the like from fine writing paper to mattress cartons and, is compact, streamlined, highly portable and dependable. Although, the preferred embodiment is described in relation to counting sheets of paper, no such limitation is intended nor required; the improvements described herein can be used with any similar device for counting any of a variety of stacked articles and segregating them into counted groups.

A heavy circular base **20** supports the sheet counting and tab inserting mechanism **21**, and prevents it from being easily tipped over. Attached to the base **20** is a telescopic supporting member **22** which allows the sheet counter to be used with many different machines by simply adjusting the head **24** to any desired height. The head **24** is supported on a ball joint connector **26** which facilitates the feeding of tabs at any angle by allowing the head to tilt and move both laterally and vertically. The ball joint connector **26** and the telescopic supporting member **22** together allow the device to be used with practically any device which is stacking paper.

Mounted on top of the ball joint connector **26** is the movable head **24** which contains the mechanisms for counting and inserting tabs including the electronic circuitry **25**. The electronic circuitry **25** merely represents the elements shown in FIG. 3 and the operation of the circuitry is described in detail below.

A portion of the casing **28** of the head **24** has been removed so that the feeding mechanism can be clearly seen. A roll of suitable tab material **30**, such as paper, which may be Bristol board or the like is mounted on a reel **32** and one end is threaded into the head **24**. Within the head **24** the tab material **30** passes between two rollers **34** and **36**. When one or both of the rollers, in this embodiment roller **36**, is driven by a motor **38** the material **30** advances through the head and along a feeding bar **40** which may be of any convenient length.

The paper **30** then advances past a knife **42** and onto the top of a stack of papers **43**. After a given time has elapsed the knife **42** is rotated by the shaft **44** to cut the paper. A solenoid **46** within the head **24** is activated to rotate the shaft **44**. A spring **47** biases the knife **42** in the normal position shown in FIG. **2** so that after the paper material **30** has been cut the knife **42** returns to that position.

The improved device **21** shown in FIGS. **1** and **2** has the distinct advantage of ease in loading a new roll of tab material in that it is unnecessary to open the head **24** to thread the new roll of paper through the device. The end of a new roll of paper can be merely inserted between the rollers **34** and **36** and the motor **38** operated until the paper advances past the knife **42** at which time the motor can be shut off and the knife **42** used to remove material extending beyond the knife **42**. Thereafter the device **21** is ready to operate and it is only necessary to set the counter and commence operating the machine which is stacking the items being grouped.

A variety of devices can be used to indicate to the counter **54** that a sheet has been stacked including a microswitch mounted on the reel arm of the stacking device or a photoelectric eye and cell disposed so that each sheet of paper which is stacked momentarily cuts the beam, the light thereby creating an electrical pulse. Alternatively, a small switch can be disposed above the stack of sheets **43** so that it is closed or opened by contact with each sheet as it is placed on the stack. However, a microswitch mounted on an arm or in a similar position on the press or stacking device has a number of advantages and is preferred.

On the exterior of the head **24** a number of switches, knobs, buttons or the like which can be used to fully control the operation of the device can be mounted. The number of sheets to be counted as one group can be set for example on a dial so that the counter will count until that number is reached and then produce a suitable signal which causes the motor **38** to advance the strip **30** and place a tab atop the pile **43**. Also, the length of the tab can be altered by setting another control mechanism such as a dial which changes the length of time during which the feed motor advances the tab and hence the length of the tab. Also, the time between the placing of the tab on the stack **43** and the operation of the knife **42** to cut the paper strip **30** can be altered as desired by operating an exterior control. Several other control mechanisms can also be mounted conveniently on the exterior of the head **24**.

Reference is now made to FIG. **3** which shows a block diagram of the circuit **25** and other elements for performing the counting, feeding and cutoff functions described above for the device shown in FIGS. **1** and **2**. In this embodiment, the stacking of each individual sheet of paper is recorded by the closing or opening of a switch **50**, but as mentioned above, any suitable type of switch or device can be used.

The closing or opening of switch **50** indicating that a sheet has been placed atop the stacks **43** then activates a Schmidt Trigger circuit **52** which produces a short electrical pulse of any chosen width which is conveyed to the counter **54** which can be of any suitable type. Since the Schmidt Trigger **52** produces only one output signal for each opening or closing of the switch **50**, the device **21** will not continue blindly counting should a malfunction cause the switch **50** to freeze in one position. One pulse only will be produced for each sheet stacked.

The counter **54** has been preset for example by means of an exterior dial on the head **24** to produce another electrical signal each time the number set to be in one group coincides with the number of accumulated pulses received from the Schmidt Trigger **52**. This pulse producing action by the counter **54** upon reaching the set number is represented in FIG. **3** by the closing of an internal switch **56**. The counter **54** then begins to count again, repeating this pulse producing action represented by the closing of switch **56** when the preset count is once again reached.

Closing switch **56** in turn activates the time circuit **58** resulting in certain electrical connections which cause the electrical motor **38** to operate and to rotate the roller **36** and thereby to advance the paper strip **30** through the device **21** and atop the pile of sheets **43** during a variable time interval. However, at the end of the variable time interval, the timer circuit **58** abruptly terminates the power to the motor **38** causing it to cease advancing the paper strip **30**. This variable time interval which in fact determines the length of the marking tab placed atop the pile **43** can for example be determined by setting a variable resistor **62** by a external dial on the head **24** or by any other suitable arrangement.

Power to the motor **38** may be simply ended to stop the advance of the paper strip **30** or a brake **63** may be activated by electrical connections made by the timer **58** at the end of the variable time interval to stop the motor immediately without coasting. Using a brake considerably improves the uniformity of length of the paper tabs inserted since any overtravel of the motor **38** varies somewhat with the frictional resistance of the paper and hence the tab length varies slightly as the roll of paper shrinks with use.

Also, at the end of the variable time interval time delay circuit **64** is activated so that after another variable time delay has elapsed the knife solenoid **46** is activated to rotate the shaft **44** and operate the knife **42** to cut the strip **30**. Since the time between the placing of the paper strip **30** atop the pile **43** and the activation of the solenoid **46** determines the number of sheets which will be piled on top of the paper strip **30** before cutting, this time delay of time delay circuit **64** can be set to any given value so that any given number of sheets will be piled on top of the strip **30** before cutting. The number of sheets necessary to hold the tab between the sheets of course varies with the type of paper, length of the tab and several other variables so that the ability to alter this time increases the ability of the device **21** to adapt itself to any given situation.

Furthermore, the feed switch **70** which merely represents a means of operating the motor **38** without disturbing the counter **54** can be closed at any time to cause the motor to advance the strip **30** atop the stack **43** or to advance the end of a new roll of paper through the device **21**. The closing of switch **70** then causes the motor **38** to operate and at the end of that operation which continues as long as the switch **70** remains closed causes the knife solenoid **46** to operate the knife **42**. Therefore, a tab can be inserted at any time, for example to note an imperfect sheet or a machine malfunction etc., without altering the count. As discussed above the ease in loading a new roll of material results because the end can be merely threaded between the rollers **34** and **36** manually and the motor operated by closing switch **70** until the strip **30** extends beyond the knife **42**.

Also, a skip count mechanism **72** can be used to remove any number of sheets and then cause the counter **54** to cease counting for that number. Defective sheets or sample sheets can then be removed without disrupting the count of the counter **54**.

The use of electronic control circuitry results in an increase in dependability and decreases in cost and size over prior art devices such as the aforementioned Lauffer device. The decrease in size allows all of the elements to be mounted in the head **24** where maintenance can be accomplished easier and the ability to withstand rough treatment enhanced.

Many changes and modifications of the above embodiment are possible without departing from the spirit of the invention. Accordingly, the scope of the invention is limited only by the scope of the appended claims.

I claim:

1. A portable apparatus for counting sheets of paper being individually stacked in a pile by a separate stacking device and placing a marking tab atop the pile whenever the number of sheets stacked atop the last marking tab placed is equal to a chosen number comprising:

a portable casing;

means for indicating by a first electrical signal each time a sheet of paper is stacked atop said pile;

electrical counting means having means to choose said chosen number and electrically connected to said indicating means for counting the number of said first signals indicated by said indicating means and producing a second electrical signal when the count is equal to said chosen number;

an electrical motor for advancing a strip of paper so that a portion of said strip is placed atop said pile;

an electrical timer circuit mounted in said casing and connected to said counting means for causing said motor to operate during a given time interval determined by said timer circuit after said second signal is produced and having variable electrical means to alter said time interval of motor operation to alter the length of said marking tab; and

means for cutting said strip after said portion is placed atop said strip so that a marking tab, at least a portion of which is covered by sheets of paper subsequently stacked on tab, remains.

2. Apparatus as in claim 1 including time delay circuit means for causing said cutting means to cut said strip after a given time has elapsed after a portion of said strip is advanced atop said pile and having means to change said given time.

3. Apparatus as in claim 2 including a brake associated with said motor, said brake being operated to stop said motor when said given time interval has elapsed.

4. Apparatus for counting sheets of paper being individually stacked in a pile and placing a marking tab atop the pile whenever the number of sheets stacked atop the last marking tab placed is equal to a chosen number comprising:

switch means for producing a first electrical signal whenever a sheet is stacked atop said pile;

pulse producing means connected to said switch means for producing an electrical pulse each time said switch means produces said first electrical signal;

counting means having means for choosing said chosen number and connected to said pulse producing means for counting the number of said pulses produced and producing a second electrical signal when the count is equal to said chosen number;

a strip of paper;

a pair of rollers having said strip of paper disposed between them so that the rotation of said rollers causes said strip of paper to advance so that a portion of said strip is atop said pile;

an electrical motor for causing said rollers to rotate;

a timer circuit connected to said counting means for causing said motor to operate, and thereby to cause said rollers to rotate, during a given time interval and having means to alter said time interval;

a brake associated with said motor and connected to said timer circuit for causing said motor to stop at the end of said time interval;

knife means for cutting said strip after said portion is atop said pile so that a marking tab remains, a portion of said tab being covered by subsequently stacked sheets;

solenoid means for causing said knife means to cut said strip; and

time delay circuit means for causing said solenoid means to cause said knife means to cut said strip after a given time has elapsed after said portion is advanced atop said pile and having means to change said given time.

5. Apparatus for counting sheets of paper being stacked in a pile and placing a marking tab atop the pile whenever the number of sheets stacked atop the last marking tab placed is equal to a chosen number comprising:

switch means for producing a first electrical signal when a sheet is stacked atop said pile and pulse producing means connected to said switch means for producing a pulse having given characteristics each time said switch means produces said first electrical signal;

counting means having means to choose said chosen number and electrically connected to said pulse producing means for counting the number of said first signals produced by said switch means and producing a second electrical signal when the count is equal to said chosen number;

an electrical motor for advancing a strip of paper so that a portion of said strip is placed atop said pile;

a timer circuit connected to said counting means for causing said motor to operate during a given time interval and having means to alter said time interval to alter the length of said marking tab;

means for cutting said strip after said portion is placed atop said strip so that a marking tab, at least a portion of which is covered by sheets of paper subsequently stacked on said tab, remains; and

time delay circuit means for causing said cutting means to cut said strip after a given time has elapsed after a portion of said strip is advanced atop said pile and having means to change said given time.