Oct. 27, 1953 A. DE PALMA 2,656,979

SHEET COUNTING DEVICE FOR SHEET HANDLING MACHINES

Filed June 8, 1951 6 Sheets-Sheet 1

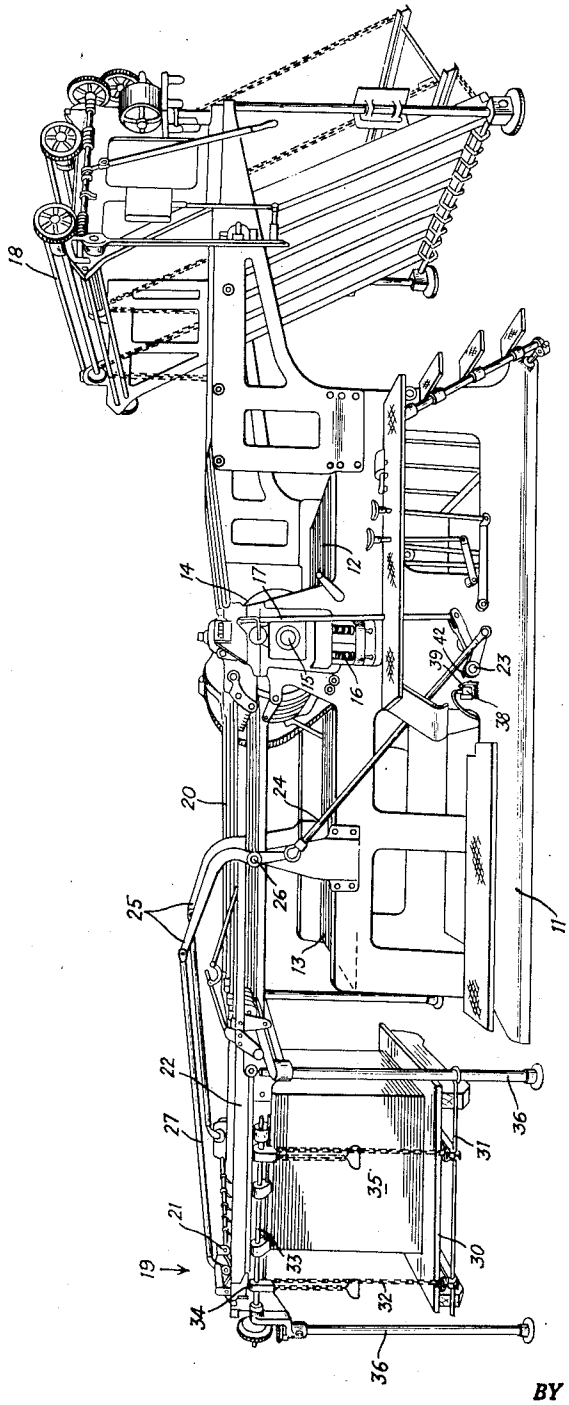


Fig. 1

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Filed June 8, 1951 6 Sheets-Sheet 2

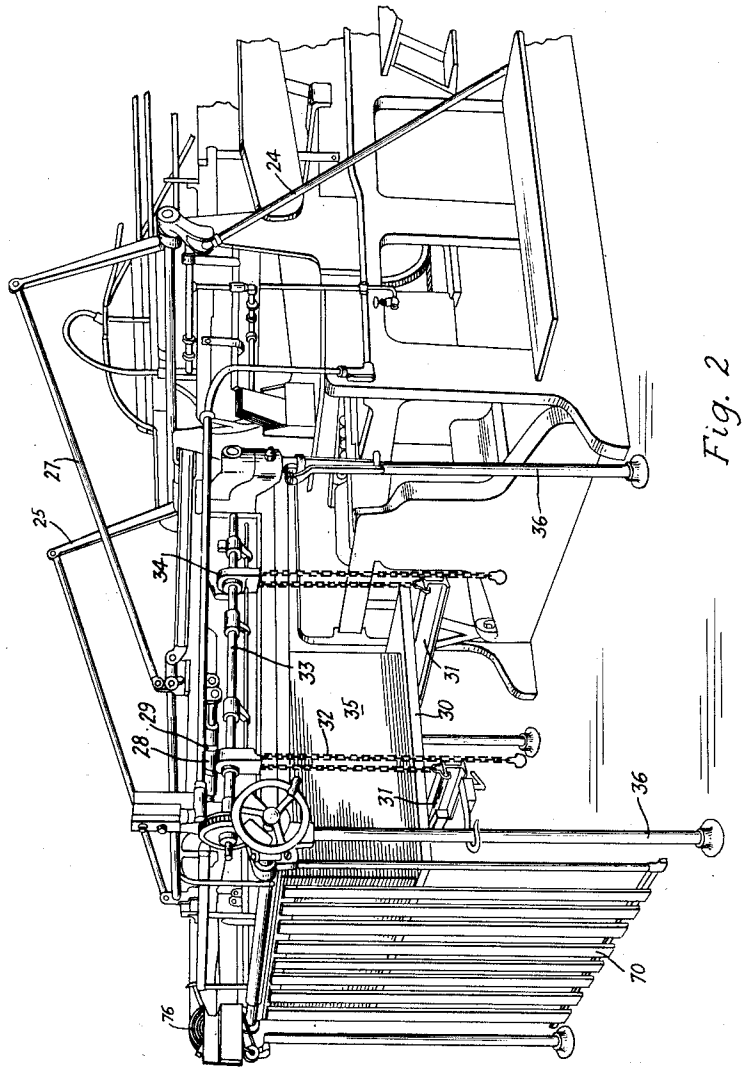


Fig. 2

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Filed June 8, 1951 6 Sheets-Sheet 3

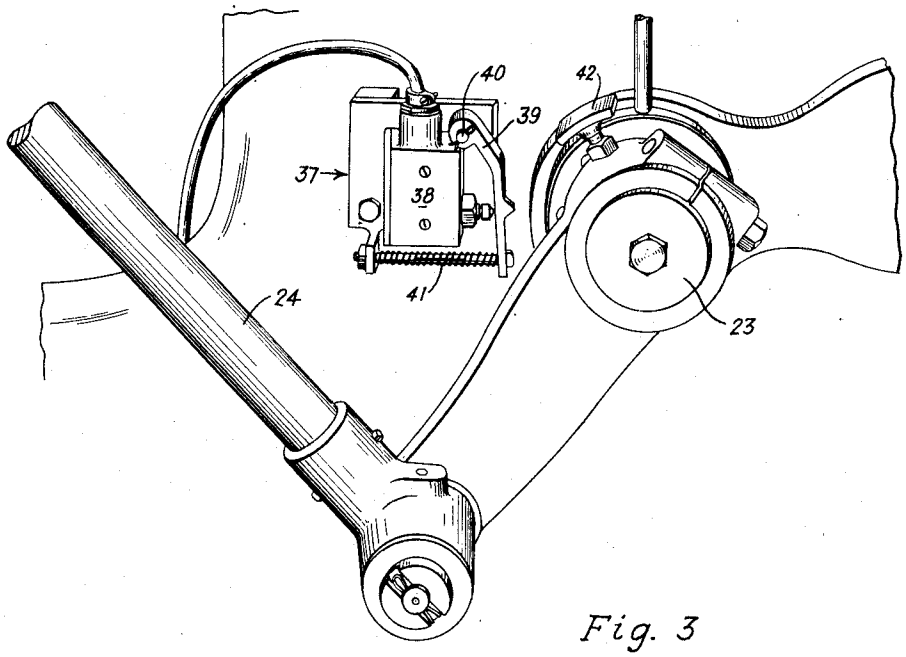


Fig. 3

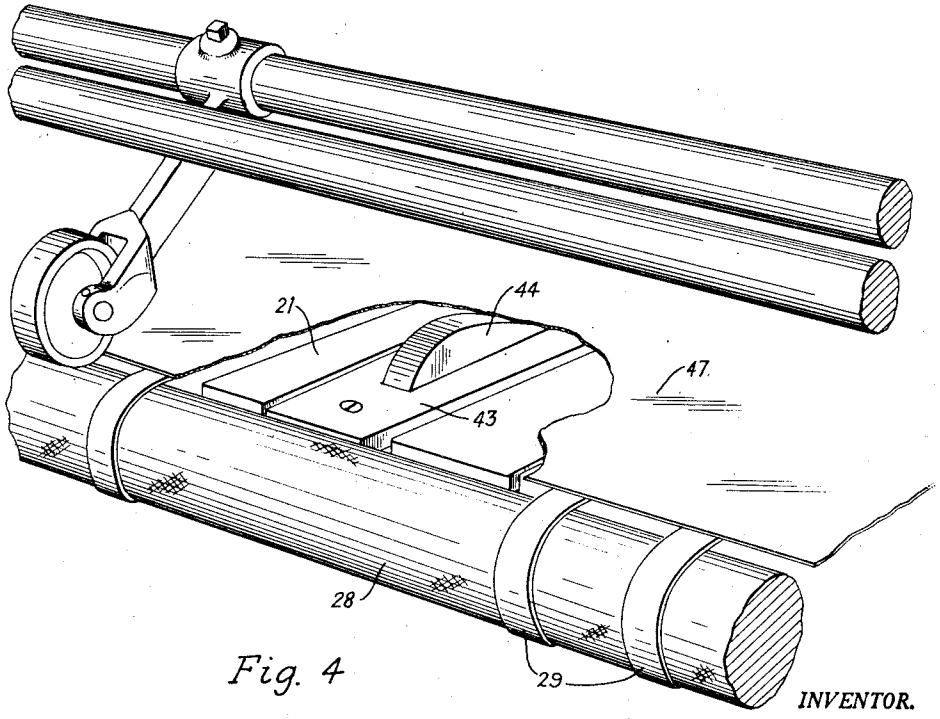


Fig. 4

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SHEET COUNTING DEVICE FOR SHEET HANDLING MACHINES

Filed June 8, 1951 6 Sheets-Sheet 4

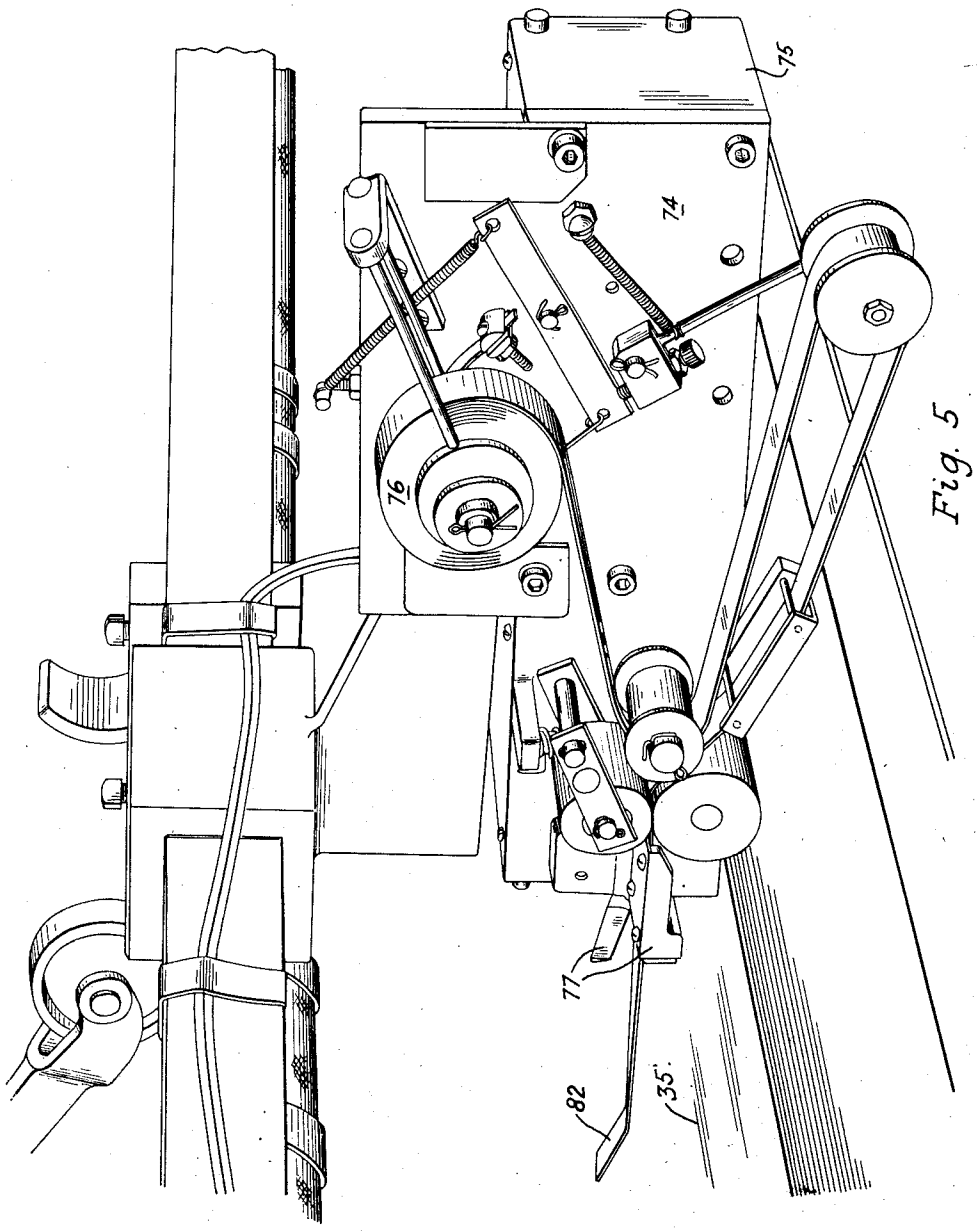


Fig. 5

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SHEET COUNTING DEVICE FOR SHEET HANDLING MACHINES

Filed June 8, 1951 6 Sheets-Sheet 5

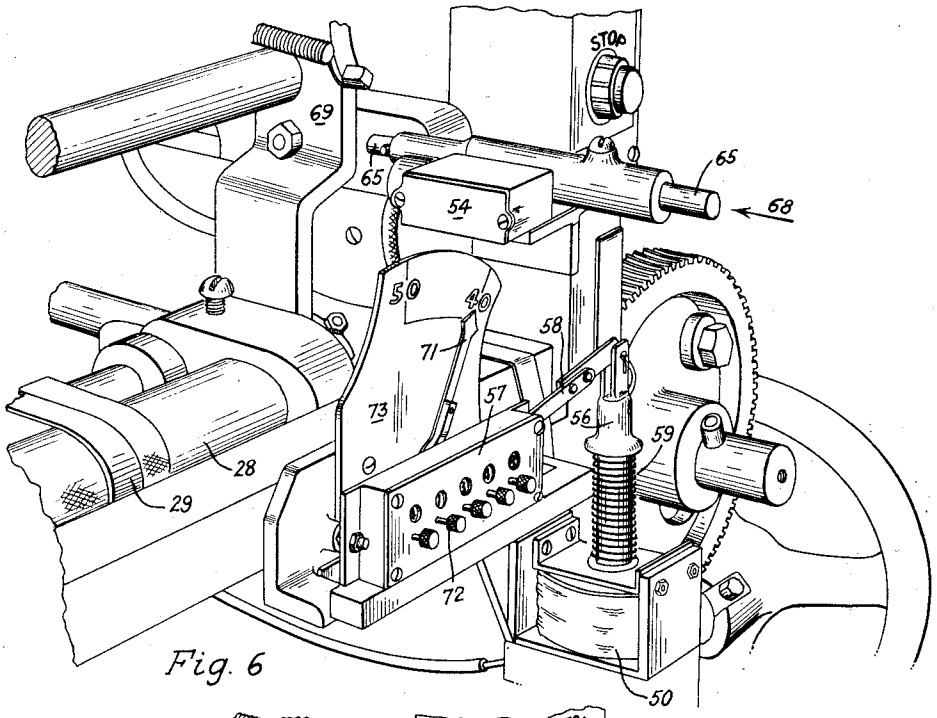


Fig. 6

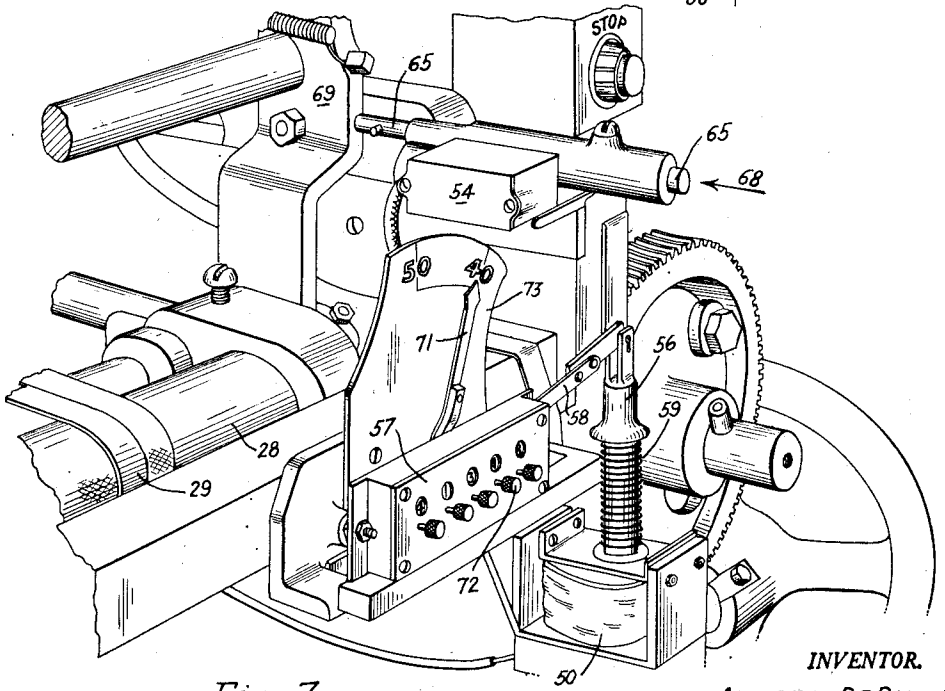


Fig. 7

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SHEET COUNTING DEVICE FOR SHEET HANDLING MACHINES

Filed June 8, 1951 6 Sheets-Sheet 6

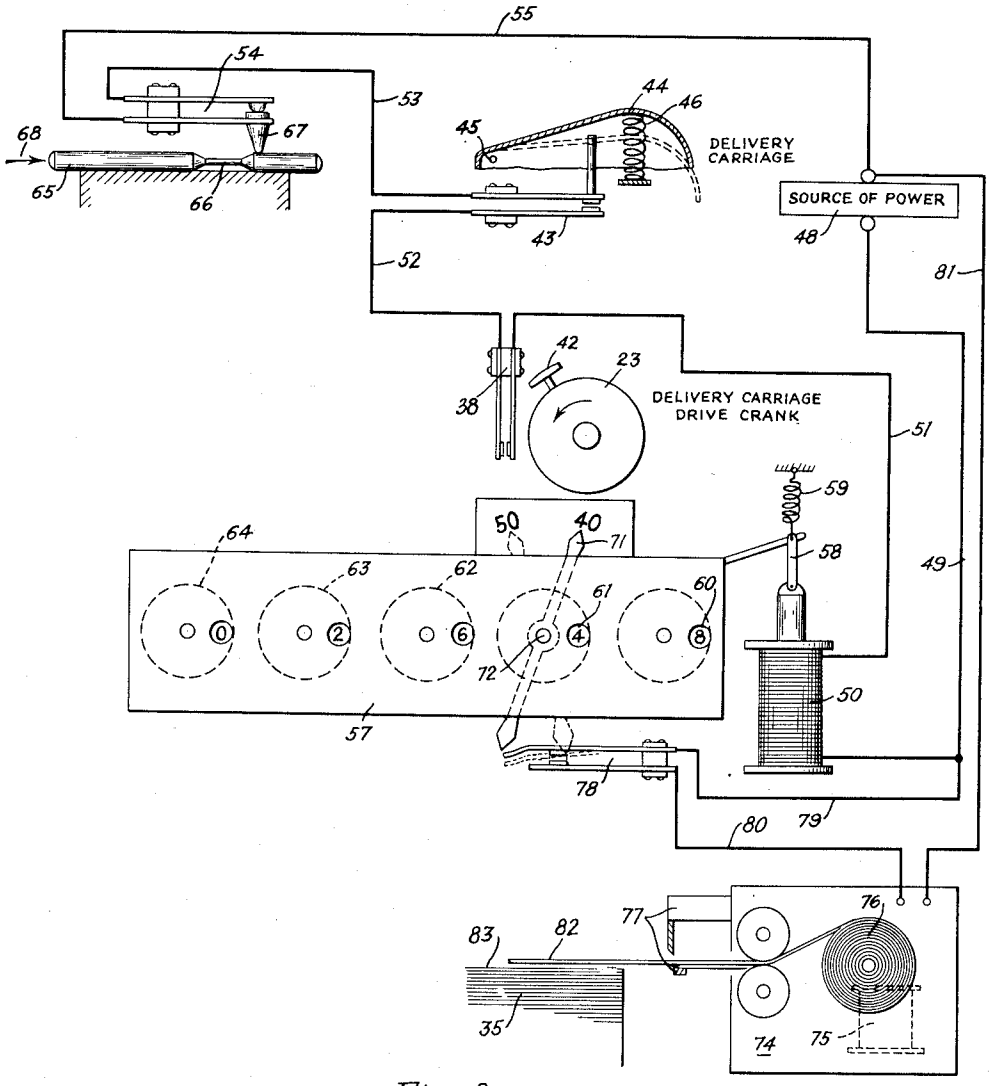


Fig. 8

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UNITED STATES PATENT OFFICE

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SHEET COUNTING DEVICE FOR SHEET HANDLING MACHINES

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Application June 8, 1951, Serial No. 230,630

3 Claims. (Cl. 235—98)

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This invention relates to improvements in devices for counting, recording, or marking the number of sheets delivered by a press.

Sheet counters are, of course, basically known and are in wide use on presses handling sheet material, such as cutting and creasing presses for paperboard or boxboard, printing presses, and other types of presses for the treatment, or decoration, of sheets of material of metallic or non-metallic composition.

It is common practice, for example, to equip printing presses, or cutting and creasing presses with counters which are either mechanically operated or operated through the medium of an auxiliary power, such as electricity, or a fluid under pressure, for example compressed air.

The conventional counting devices may be grouped into two classes:

There are firstly those counters which are operated in response to strokes, shaft revolutions, or other operational cycles of the press. Counters of this type are, in effect, shaft revolution counters or delivery stroke counters, in brief, devices which count mechanical cycles of the press rather than sheets. Evidently the count made by such a device becomes erroneous if, at times, no sheet passes through the press or, if sheets are removed from the press for checking purposes. It thus becomes apparent that counters of the aforementioned class generally furnish too high a count.

There are secondly those counters which are responsive to the presence or absence of a sheet at a certain portion of the machine, for example on the delivery carriage. Such counting devices, however, are also unreliable as an example will show. It has been proposed, for example, to control an electrically operated counter by a switch responsive to the pressure of a sheet on the delivery device of the machine, for example on the reciprocating delivery carriage with which many presses are equipped. Due to operational factors, such as the speed of the press, the weight of the sheet, and the occasional presence of air drafts in the press room, sheets tend to flutter somewhat on the carriage, especially shortly after being transferred onto the delivery carriage, with the result that the counter switch is occasionally operated more than once by the same sheet. For this reason the count furnished by counters of the latter type is also subject to errors.

The determination of an accurate count is further complicated by the fact, that it is necessary from time to time to remove sheets from

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the machine, for the purpose of eliminating imperfect sheets or for the purpose of inspecting the quality of the work. It is therefore desirable that the counter should not count or record such removed sheets, so that the automatic count includes only sheets actually delivered.

The invention provides an automatic device which furnishes an accurate count of sheets actually delivered, yet permits removal of individual sheets from any portion of the machine without an error in the count.

The invention further provides a counter which is unaffected by fluttering of the sheets, whereby a repeated count of the same sheet is avoided.

The invention involves a combination of actuating devices for the counter, arranged in such a way that each actuator checks and eliminates the errors to which the other actuator is normally subject.

The use of plural actuators, as such, is not fundamentally novel. It has, for example, been proposed to count newspapers delivered by a printing press by a revolution type of counter operated by the press proper, and to check the counter by rendering it inoperative in the event no paper is present at a given time at a certain portion of the machine. For example it has been proposed to determine the presence or absence of a paper at the check point by a photoelectric cell which renders the counter temporarily ineffective until the steady flow of papers past the check point is restored.

However, the known devices, as far as can be ascertained, do not lend themselves to use on sheet handling presses of the general character with which this invention is concerned.

In the paper box industry an accurate count of sheets is of particular importance since an error in the count by one sheet is not equivalent to an error of the same magnitude in the finished product, namely paperboxes, but amounts to an error of multiple magnitude, since a single sheet usually contains a number of individual box blanks.

The various objects, features, and advantages of this invention will appear more fully from the detailed description which follows accompanied by drawings showing, for the purpose of illustration, a preferred embodiment of this invention. The invention also consists in certain new and original features of construction and combination of elements hereinafter set forth and claimed.

Although the characteristic features of this invention which are believed to be novel will be

particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages and the manner in which it may be carried out may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part of it in which:

Figure 1 is a side view of a cutting and creasing press equipped with an automatic counting device embodying this invention;

Figure 2 is a perspective view of the delivery end of the machine shown in Figure 1;

Figure 3 is a perspective view of a switch operated by a shaft cam;

Figure 4 is a perspective view of the front end of the delivery carriage, a portion of the sheet on the carriage being torn away to show the location of a further switch;

Figure 5 is a perspective view of an automatic tab inserter for marking sheets in the delivery unit in multiples of 50 by paper tape inserted in the stack; in any multiples from 2 thru 2000;

Figure 6 is a perspective view of a unit counter and of a further switch forming a part of a preferred form of this invention;

Figure 7 is a detailed view showing the switch of Figure 6 after manual setting and immediately prior to automatic restoring by the delivery carriage; and

Figure 8 is a diagrammatic illustration, in somewhat simplified form, of the invention illustrated in Figures 1–7.

In the following description and in the claims various details will be identified by specific names for convenience. The names, however, are intended to be as generic in their application, as the art will permit. Corresponding reference characters refer to corresponding parts in the several figures of the drawings.

In the drawings accompanying, and forming part of, this specification certain specific disclosures of the invention, as applied to a cutting and creasing press, is made for the purpose of explanation of broader aspects of the invention, but it is understood that the details may be modified in various respects without departure from the principles of the invention and that the invention may be applied to other machines, and embodied in different form of apparatus than shown.

The press shown in Figure 1 is of the type in which the cutting and creasing die is mounted on a flat bed, it being obvious that a multi-cylinder press could take its place in which the cutting and creasing die has cylindrical curvature. The press comprises a base 11 on which a bed 12 moves back and forth on tracks. The bed contains the usual cutting and creasing die (not shown in detail) and moves underneath a cylinder 14. The cylinder is supported in bearings of which one is visible at 15 and is normally supported by springs 16 in a position in which the periphery of the cylinder is spaced from the surface of the cutting and creasing die. A lever, rod and cam assembly 17 forms part of the drive of the press and serves to lower the cylinder 14 into contact with the cutting and creasing die, this being the usual arrangement in presses of this type.

A sheet feeder 18 feeds sheets towards the cylinder where the sheets are grasped in the usual way to envelop the cylinder, while the cutting and creasing die passes underneath, and the cut and creased sheet then moves on towards the delivery section 19 of the press by the usual feed belts 20. A delivery carriage 21 is movable back and forth on tracks 22 and is driven by a crankshaft 23, also forming part of the drive mechanism. A connecting rod 24 on either side of the machine leads to an oscillating double-armed lever 25 pivoted at 26 from which a further connecting rod 27 extends to the delivery carriage 21.

The illustrated mechanism transforms the rotary motion of the crankshaft 23 into an oscillating motion of the levers 25 which, in turn, cause the delivery carriage 21 to move back and forth between the cylinder 14 and the delivery end of the machine. In the illustrated position the delivery carriage is practically at the end of its delivery stroke and it is apparent that after rotation of the crankshaft through approximately 180° the delivery carriage will be closest to the cylinder to pick up the next sheet.

The delivery carriage comprises two spaced transverse rollers of which one is visible at 28, and a number of belts 29 are trained around the rollers to carry and deposit the sheets onto a skid 30. For this purpose the rollers are intermittently driven every time the delivery carriage retracts, this being conventional construction.

The skid 30 rests on transverse bars 31 and the bars, in turn, are suspended by chains 32 from shafts 33 fitted with chain sprockets 34. The shafts 33 are driven at a rate to maintain the top of the pile of sheets 35 at substantially the same level. The shafts 33 are suitably supported on four vertical posts 36.

All the foregoing is conventional construction.

Turning now to the sheet counting mechanism, an electrically operated mechanism is shown, it being obvious that other sources of auxiliary power, for example compressed air, could be employed. A first power switching means 37 is mounted at the crank shaft 23 and includes a micro-switch 38 fitted with a lever 39 pivoted at 40. The micro-switch is of the "make" type and a spring 41 normally keeps the lever 39 in a position in which the switch is open.

A cam 42 is mounted on the crank shaft 23 in such a position that it strikes the lever 39 and closes the switch in a position in which the delivery carriage is near the end of its delivery stroke. Preferably the contact is closed after the delivery carriage has moved past the halfway mark on its stroke towards the sheet pile 35. The reasons for this timing will later become apparent. It is quite evident that the switch 38 will be closed once during each revolution of the crank shaft 23 which, in turn, corresponds to one delivery stroke followed by a return stroke. It is evident that a counter operated by the switch 38 alone will only furnish an accurate count if a sheet is delivered during each and every delivery stroke. This however is not always the case in actual practice, particularly not during starting and stopping of the press when the press may run idle for a few strokes.

Referring to Figure 4, a second switch 43, also of the "make" type, is mounted on the delivery carriage near its forward end. The switch includes an actuating lever 44 pivoted at 45 (Figure 8). The lever 44 is normally kept in an open switch position by a spring 46, the spring being sufficiently weak to permit deflection of the lever 44 into closed contact position by the weight of a sheet 47 on the carriage. In Figure 4 the sheet is torn out around the switch to show the location of the switch more clearly.

Assuming, that a counter were operated by the switch **43**, it is evident that no count will be made unless a sheet is actually carried by the carriage. Since, however, sheets tend to flutter on the carriage, when first deposited on the carriage by the belts **20**, the switch **43** is likely to be closed more than once during the delivery stroke leading to an erroneous count.

The results of fluttering of the sheets are eliminated by placing the switch **43** in series with the switch **38**. As previously stated, the switch **38** is not closed until the delivery carriage has moved past the half-way mark of its delivery stroke at which point the sheet has stopped fluttering and is quite steady on the carriage. It is thus seen that the errors to which the switch **43** is subject are eliminated by the switch **38** and, conversely, the errors to which switch **38** is subject are eliminated by switch **43** since the circuit for operating the counter is not completed unless a sheet is actually present on the carriage.

The arrangement of the switches in the counter circuit is illustrated in Figure 8.

From a suitable source of electric power **48** a lead **49** extends to a solenoid **50** and a further lead **51** runs from the solenoid **50** to the switch **38**. A lead **52** extends between the switches **38** and **43** and a further lead **53** runs to a manually operable switch **54** whose purpose will later become apparent. A lead **55** completes the circuit back to the source of power **48**. It is obvious that the solenoid **50** will not be energized unless the three switches **38**, **43** and **54** are closed.

The solenoid **50** has an armature **56** connected to a conventional counter **57** by a linkage **58**, the linkage being biased by a spring **59**.

The counter includes a number of indicator wheels **60**, **61**, **62**, **63** and **64** for singles, tens, hundreds, thousands and ten thousands respectively.

It is frequently desirable to provide for a mechanism which permits the machine operator to remove a sheet from the machine in such a way that the removed sheet is not counted. This is accomplished by the manually operable switch **54** which is preferably of the "break" type and is operable by a plunger **65**. This plunger has a portion **66** of reduced diameter into which a cam **67** may move if the plunger is displaced in the direction of the arrow **68**.

If the operator wishes to remove a sheet from the press he presses the plunger **65** in the direction **68**, causing the switch **54** to open. A sheet on the carriage causes the switch **43** to close, and the switch **38** closes when the cam **42** strikes the lever **39**. At this time however the switch **54** is open and no count is made, the solenoid **50** remaining unenergized. The operator thus may remove a sheet from the press without causing this sheet to be counted.

The next sheet however will be counted due to an arrangement which provides for automatic restoration of the switch **54** into closed position.

Referring to Figure 7, the carriage is provided with a bracket **69**. This bracket lies in line with the plunger **65** and strikes the plunger within the very last portion of its delivery stroke, and at a time at which the cam **42** has moved past the lever **39** (Figure 3).

Figure 7 shows the plunger **65** immediately prior to restoration, whereas Figure 6 shows the plunger in its normal position in which the switch **54** is closed.

Presses equipped with a device for the continuous delivery of sheets may be fitted with a manually insertable tray **70** which is slid on top

of the pile **35** and, in horizontal position, collects sheets while the filled skid **30** is being removed. This equipment does not form a part of the present invention.

It is manifestly desirable to remove the skid after a full count of sheets as accumulated thereon, a full count being a multiple of fifty. It is therefore necessary for the operator to insert the tray **70** immediately after the fiftieth sheet was deposited on the pile **35**. In order to give the operator a clearly visible signal, the counter may be equipped with a special indicator.

This indicator comprises a pointer **71** mounted on the ten-unit shaft **72** of the counter. This shaft advances 36° after each full revolution of the unit wheel **60** and is shown in the drawings in the position in which **48** sheets have accumulated on the pile. After two further actuations of the solenoid **50** the wheel **60** will read zero and the wheel **61** will advance from number 4 to number 5. The double-ended pointer **71** which is mounted on the same shaft as the wheel **61** then moves to the 50 position on a dial **73** (shown in broken lines) at which time the operator slides the tray **70** into horizontal sheet collecting position. After deposition of fifty further sheets the opposite end of the pointer **71** is in front of the dial **73**.

In order to mark, or subdivide the sheets in a pile in convenient multiples it is conventional practice to insert tabs of paper in the sheet stack by automatic tab feeders. These tab feeders, which do not form a part of the present invention, are commonly operated by cam shaft switches such as shown at **38**. The present invention permits these tab inserters to be operated with greater accuracy so that the number of sheets between the tabs is accurately fifty sheets, no more, and no less. For this purpose the actuator of the tab inserter is controlled by the switch arrangement according to this invention. There are numerous devices on the market for operating tab inserters after a predetermined number of electric impulses, such as fifty or one hundred or any other number of impulses. These devices could be operated in parallel with the solenoid **50**. For reasons of simplicity such conventional devices are not illustrated in the drawings but their operating principle is diagrammatically shown in Figure 8 by reference to a device operating on the 50-unit principle.

The tab inserter **74** comprises a solenoid **75** which feeds the tape **76** and causes a cut-off mechanism **77** to be operated periodically, details of the mechanism being conventional, and not shown for this reason.

In the diagram the second arm of the pointer **71** is shown as an actuating cam for a switch **78** connected to lead **49** by a lead **79**. A further lead **80** extends to the tab inserter **74** and a return lead **81** extends to the source of electric power **48**.

When the pointer **71** moves from the "forty" position to the "fifty" position it closes the contact **78** whereby the operating solenoid **75** of the tab inserter is energized causing a tab **82** to be inserted on top of the fiftieth sheet **83** of the pile **35**. Thereafter the tab **82** is cut off in the usual manner to protrude from the stack of sheets. This facilitates the recount of sheets removed from the press.

Since the counter **57** furnishes an accurate count of sheets, the tab inserter **74** is equally accurate.

The invention has been illustrated by reference to an electrically operated device. However, it

is evident that other sources of power, for example compressed air may be employed in which event valves would take the place of the switches.

Obviously the present invention is not restricted to the specific form herein shown and described. Various additions, omissions, substitutions and other changes may be made without departing from the principles of the spirit of this invention.

What is claimed is:

1. A device for use with a sheet handling press of the type having a reciprocable delivery carriage, for determining, by accurate count, the number of sheets delivered by such press, the device comprising, in combination, a sheet unit register; a power circuit connectible to a source of power for operating said register; a first power switching means of the make type, said power switching means being operable in response to traverse of the carriage of its delivery stroke; and a second power switching means of the make type, said second switching means being mounted on, and movable with, said carriage and actuable by the weight of a sheet on the carriage, said second switching means lying in series with said first switching means for joint operation of said register upon simultaneous actuation of both said switching means, said first switching means being arranged for actuation during passage of said carriage through the second half of its delivery stroke, whereby repeated operation of the register due to fluttering of the sheet is prevented.

2. A device for use with a sheet handling press of the type having a reciprocable delivery carriage for determining, by accurate count, the number of sheets delivered by such press, the device comprising, in combination, a sheet unit register; a power circuit connectible to a source of power for operating said register; a first power switching means of the make type, said first power switching means being operable in response to traverse of the carriage of its delivery stroke; a second power switching means of the make type, said second switching means being actuable by the weight of a sheet on the carriage, said second switching means lying in series with said first switching means; and a manually operable third power switching means of the break type for skipping a single unit count, said third switching means lying in series with said first and said second switching means for joint operation of said register by said first and said second switching means while said third switching means is closed, said third switching means being restorable by said carriage into make position at a position of the carriage closer to the end of its delivery stroke than the point of actuation of said first switching means.

3. A device for use with a sheet handling press of the type having a reciprocable delivery carriage for determining, by accurate count, the number of sheets delivered by such press, the press further including a shaft coupled with said carriage in such a way as to be actuated once for each delivery stroke of the carriage, the device comprising, in combination, a sheet unit register; an electric circuit connectible to a source of electric power for operating such register; a first switch of the make type operable by said shaft during the passage of the delivery carriage through the second half of the delivery stroke; a second switch of the make type on said carriage actuable by the weight of a sheet on said carriage, said second switch lying in said circuit in line with said first switch for joint operation of said register upon simultaneous actuation of both said switches; and a manually operable third switch of the break type for skipping a single unit count, said third switch lying in said circuit in line with said first and said second switch, said third switch being manually movable into open position and being mounted on said press for restoring into closed position by said carriage at a position of said carriage closer to the end of its delivery stroke than the point of closing of said first switch and after opening of said first switch.

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