United States Patent

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[54] MECHANISM FOR DIVIDING STACKS OF PAPER SHEETS

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[52] **U.S. Cl.**.....**214/8.5 SS,** 214/8.5 C, 271/44

[51] **Int. Cl.**.....**B65h 3/32,** B65g 59/06

[58] **Field of Search** .....271/44, 1; 214/8.5 SS

[56] **References Cited**

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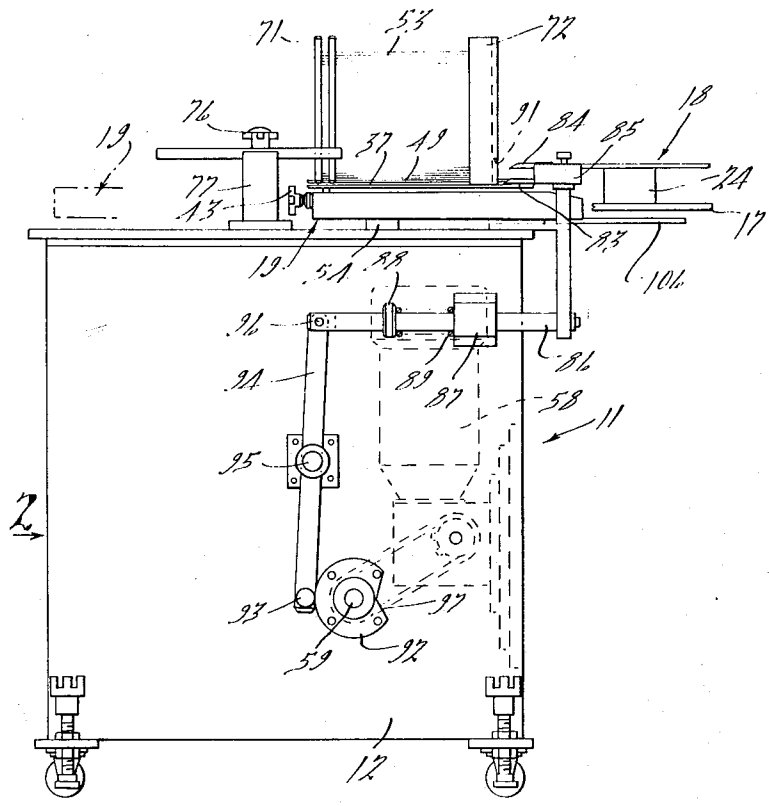
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[57] **ABSTRACT**

A mechanism for dividing stacks of paper sheets into counted groups. The stack is held in vertical guides above a carriage which carries longitudinally spaced reciprocating upper and lower platforms. As the stack drops from the upper to the lower platform a reference finger and a separating wedge approach one corner of the stack, the finger supporting the stack and the wedge entering the stack at a predetermined height above the finger. At this point the carriage begins its return movement and the upper platform enters the stack at the height of the wedge, both members then retracting. The counted group then drops between the platforms onto delivery bars.

8 Claims, 6 Drawing Figures



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SHEET 1 OF 4

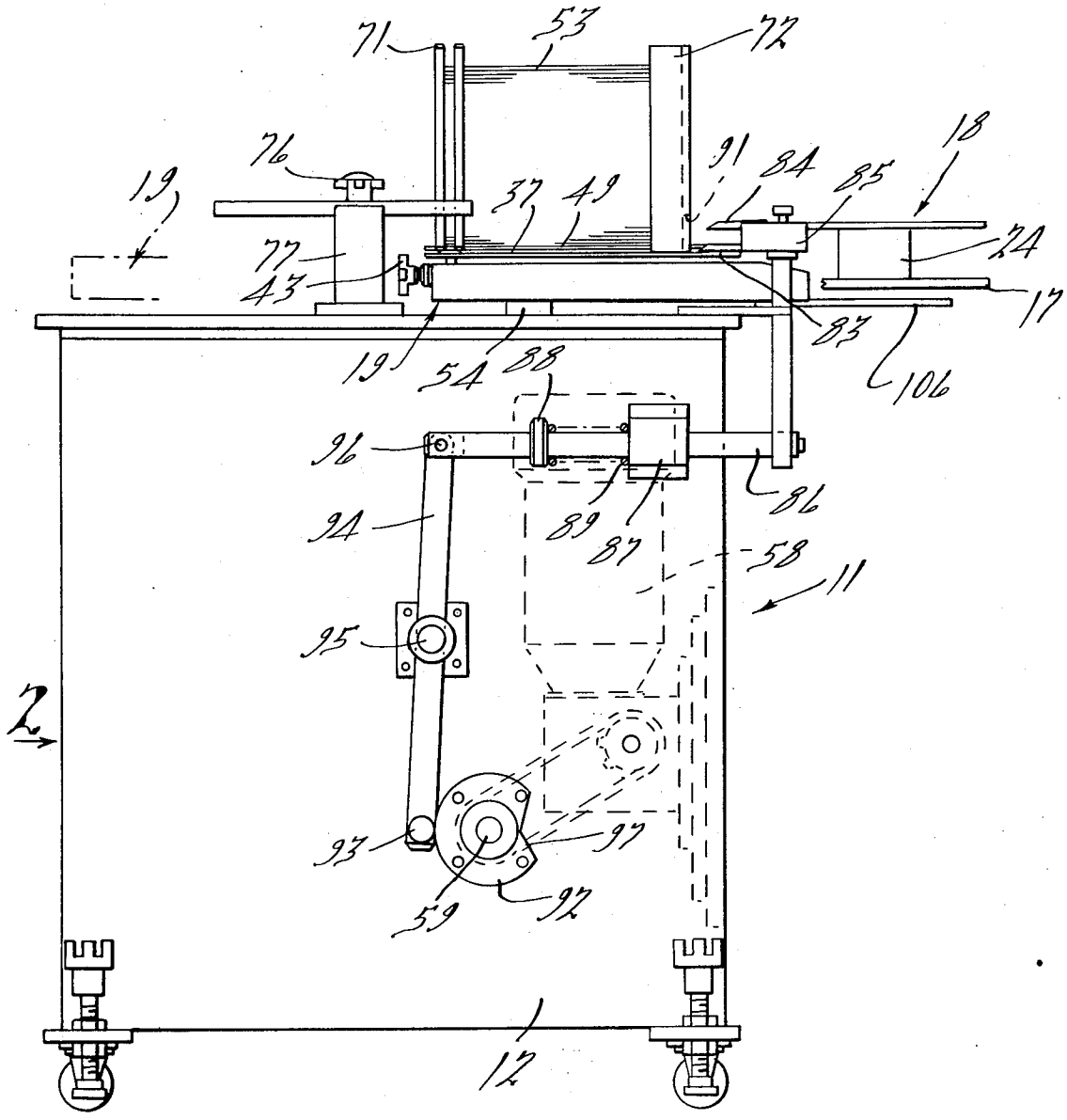


Fig. 1.

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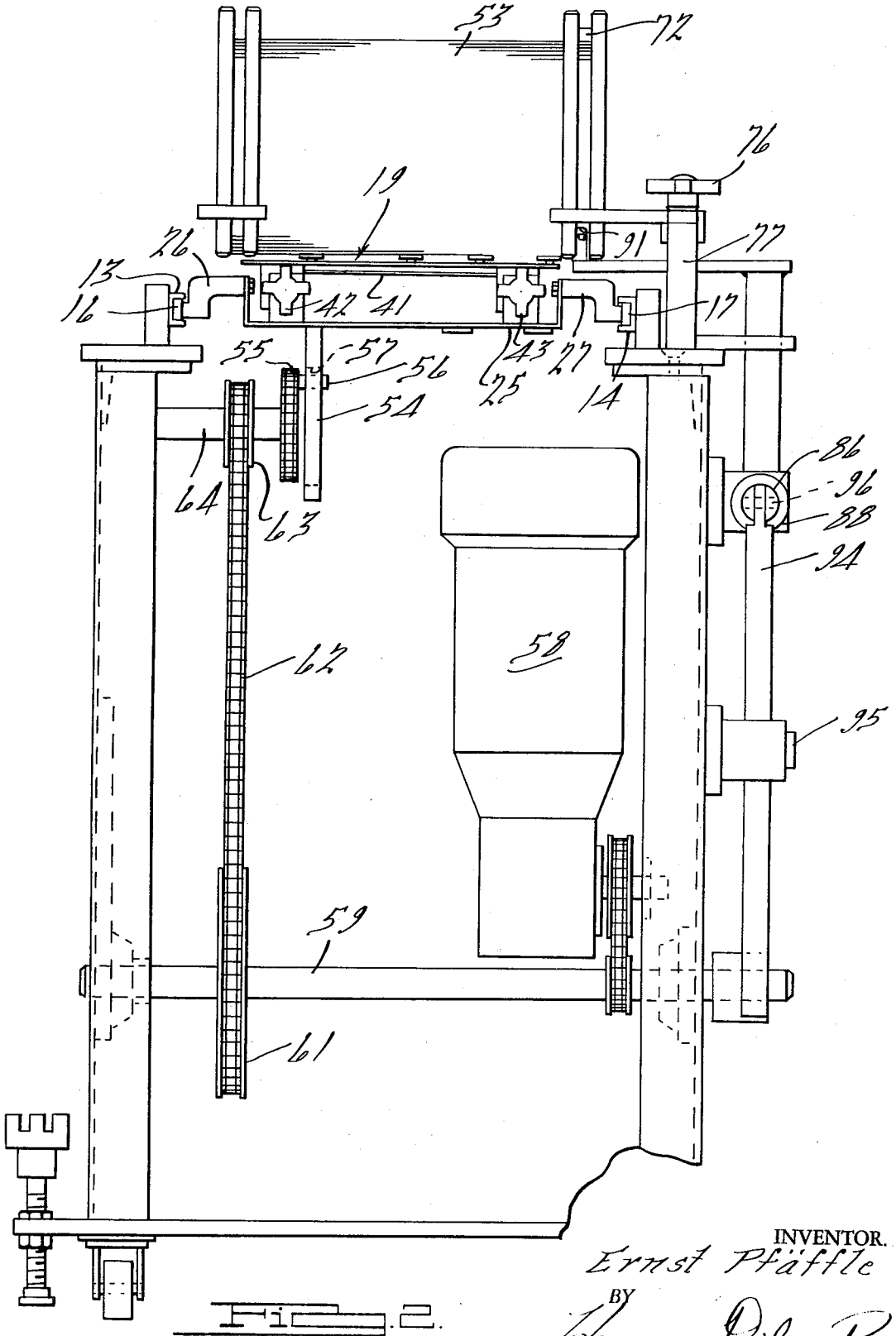
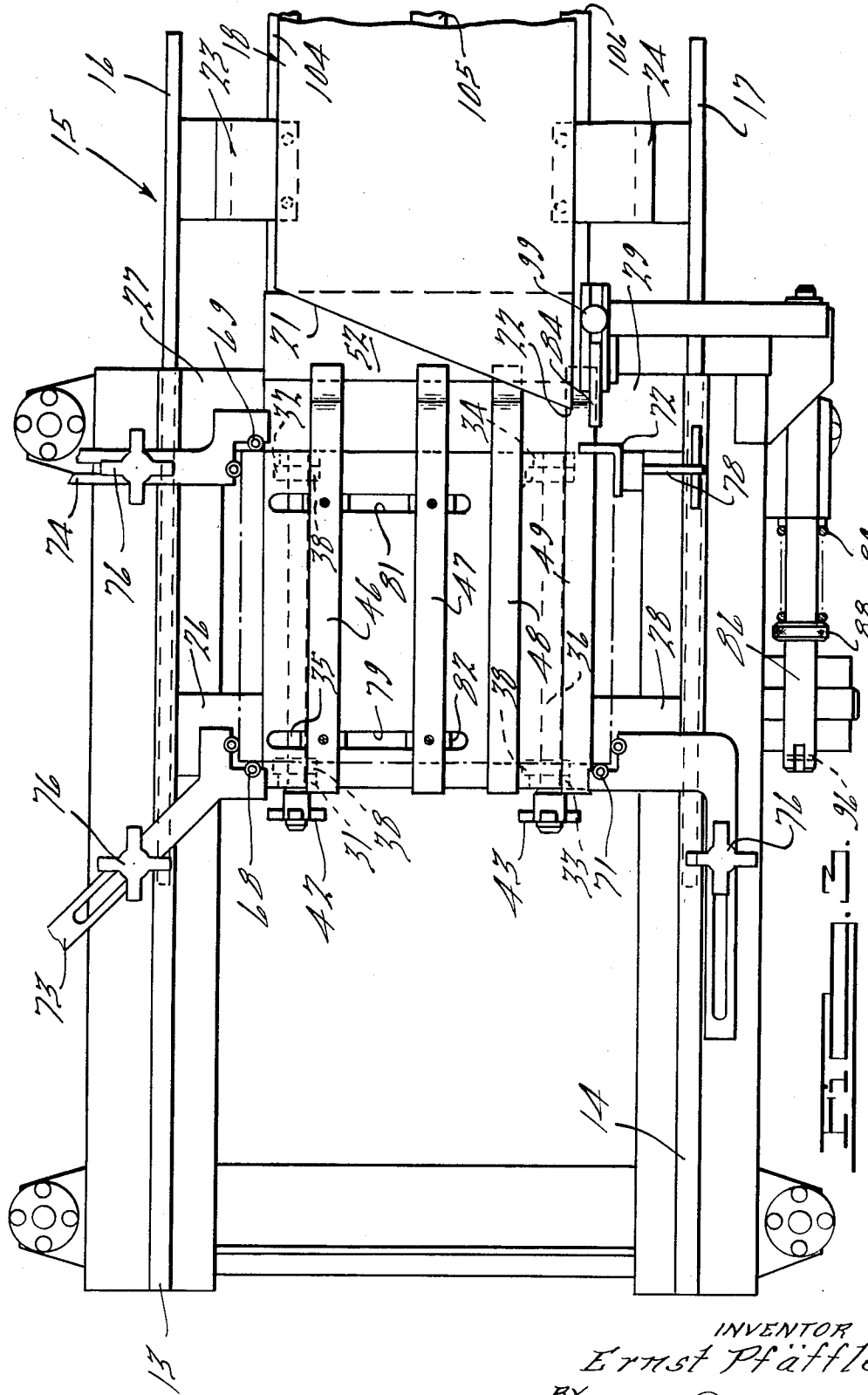


Fig. 2.

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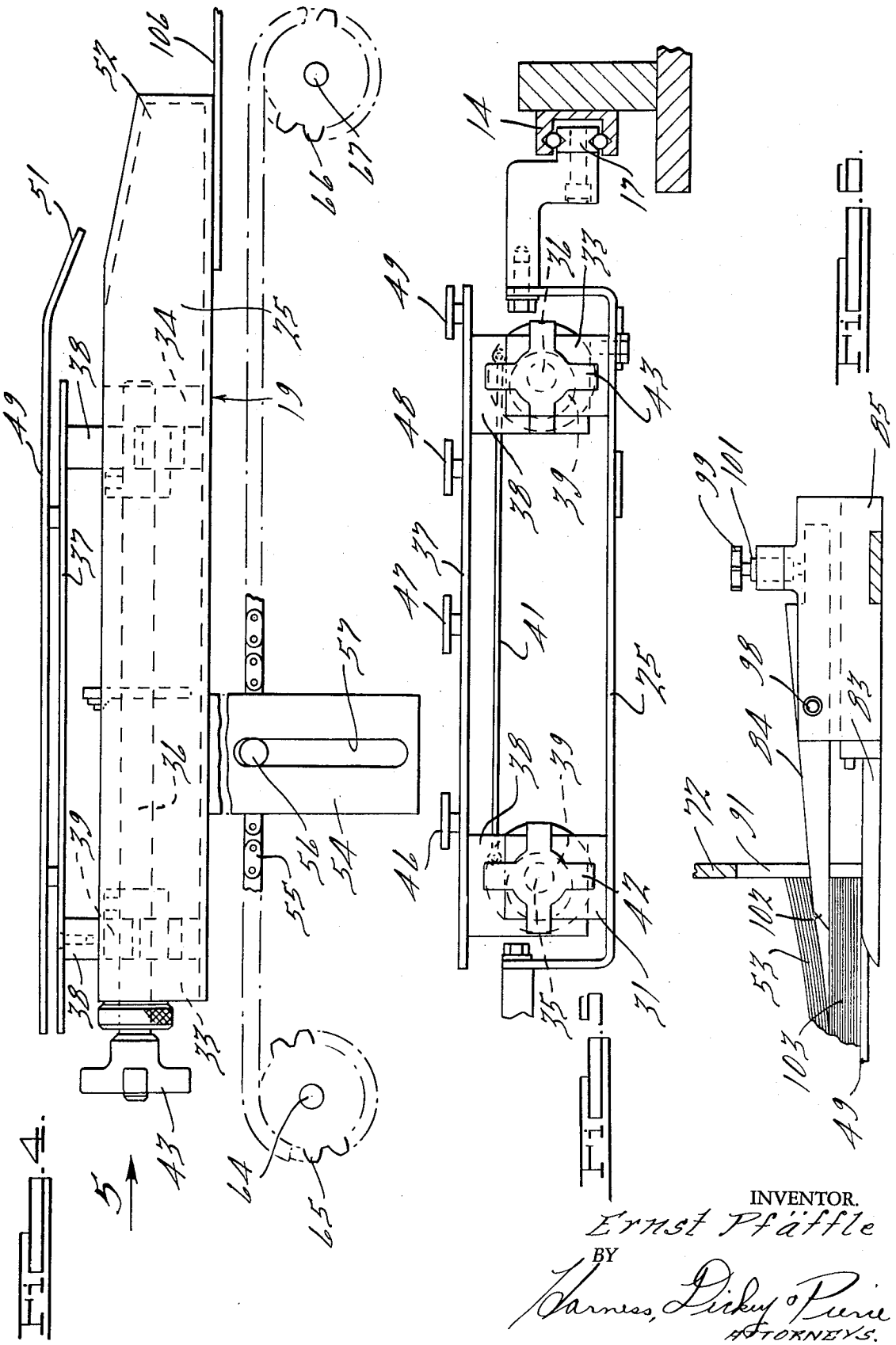


Fig. 4.

Fig. 5

Fig. 6

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MECHANISM FOR DIVIDING STACKS OF PAPER SHEETS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to paper sheets used for writing purposes, for example ruled looseleaf sheets, which are distributed in packages with each package having a group of predetermined count.

2. Description of the Prior Art

Normally a printing machine or a sheeter is employed to divide a paper web into large sheets, each sheet having a multiplicity of the sheets of final size. The counting of such sheets is conventionally accomplished at the printing machine or sheeter by means of slip sheets which are automatically placed in the stack so that it may later be divided by a sidewise pushing movement. This necessitates the provision of the slip sheet material as well as a mechanism for cutting and feeding it. Furthermore, once the slip sheets are in position the stack can only be conveniently divided at these points, which means that the manufacturer is in effect held to this count or multiples thereof for packaging purposes.

BRIEF SUMMARY OF THE INVENTION

The invention provides a separate and independent means for dividing stacks of final size sheets into groups of predetermined count, with this count being completely flexible at all times. The invention thus eliminates the need for slip sheets and their attendant cutting and feeding mechanism, and provides complete flexibility to the manufacturer for packaging groups of any number even at the last prepackaging stage.

Essentially, the invention comprises a base on which is mounted a reciprocable carriage, with stack corner guides mounted above the carriage. Upper and lower longitudinally spaced platforms are supported by the carriage, the lower platform being adjustable in height and the difference in height between these platforms approximating the thickness of the group to be counted.

The upper platform has a low friction surface and as the carriage moves it is withdrawn from the stack which starts to drop onto the lower platform. At the point where the upper platform is completely withdrawn, a reference finger and separating wedge approach one corner of the stack. The finger supports the corner at the same height as the lower platform, while the wedge enters the stack corner at the exact point of the count and cams the stack upwardly.

The carriage then begins its return movement, the inclined forward edge of the upper platform entering the separation in the stack as the wedge and finger are withdrawn. The counted group then drops below the upper platform onto receiving bars.

Upon the next forward movement of the carriage, the receiving bars will deliver the counted group to withdrawal means, while the next group is being divided from the stack.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the stack dividing mechanism;

FIG. 2 is an end elevational view of the machine taken in the direction of the arrow 2 of FIG. 1;

FIG. 3 is a top plan view of the machine;

FIG. 4 is a side elevational view of the lower platform showing the driving mechanism for the carriage;

FIG. 5 is an end elevational view of the lower platform taken in the direction of the arrow 5 of FIG. 4 and showing the height adjusting mechanism; and

FIG. 6 is a detailed elevational view of the separating wedge and reference finger.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The mechanism is generally indicated at 11 and comprises a rectangular base 12 on which is mounted a pair of tracks 13 and 14. A carriage generally indicated at 15 is mounted on these tracks, and comprises a pair of rails 16 and 17 carried by tracks 13 and 14 respectively. Between these rails extend an upper platform generally indicated at 18 and a lower platform generally indicated at 19. These platforms are longitudinally spaced from each other in the direction of movement of carriage 15.

The construction of platform 18 is seen best in FIG. 3. The platform comprises a flat plate of generally rectangular shape but having an inclined forward edge 21 with the leading corner 22 thereof on the right hand side as one faces the machine in FIG. 2. The platform is secured to rails 16 and 17 by brackets 23 and 24. The height of platform 18 is fixed with respect to base 12.

Lower platform 19 comprises a U-shaped frame 25 fixed to rails 16 and 17 by brackets 26, 27, 28 and 29. As seen in FIGS. 3, 4 and 5, two pairs of bearings 31, 32 and 33, 34 extend upwardly from base 25 and support two height adjusting shafts 35 and 36. A plate 37 is supported above base 25 by means of downward extensions 38 on the plate in which are disposed eccentrics 39 fixed to shafts 35 and 36. A tie rod 41 connects the two shafts so that they will rotate in unison. A pair of adjusting knobs 42 and 43 are mounted on the outer ends of the shafts so that the height of plate 37 may be adjusted. A pair of lock nuts 44 and 45 are mounted inwardly of the knobs to lock the plate in its adjusted position.

Four group carrying strips 46, 47, 48 and 49 are mounted on plate 37, the inner ends of these strips being inclined downwardly at 51 as seen in FIG. 4. The inner end 52 of base 25 is also downwardly inclined to accommodate strip portions 51. The vertical distance between strips 49 and upper platform 18 will approximate the thickness of the group to be counted.

Carriage 15 is reciprocated in such a way that platforms 18 and 19 will be alternately positioned at the location of the stack of paper 53 to be counted. The means for driving carriage 15 between its positions comprises a drive bracket 54 extending downwardly from frame 25 of platform 19, and an endless chain 55 having a pin 56 disposed in a slot 57 of this bracket. Chain 55 is driven by a motor 58 (FIG. 2) through a shaft 59 carrying a sprocket 61. This sprocket drives a chain 62 which in turn drives a sprocket 63 on a stub shaft 64. The stub shaft carries a sprocket 65, which, together with a second sprocket 66 on a stub shaft 67, carries endless chain 55.

Stack 53 is held in position by four vertical corner guides 68, 69, 71 and 72 seen best in FIG. 3. Of these, guides 68, 69 and 71 each comprises a pair of bars on horizontally adjustable arms 73, 74 and 75 respective-

ly. These arms have elongated slots and are clampable by knobs **76** against their respective supporting posts **77** (FIG. 1). Guide **72** on the other hand comprises an angular member which is in fixed position, being secured to base **12** by base support **78** (FIG. 3). It will thus be seen that the transverse dimension of the stack will be adjusted by means of guides **68** and **69** at the top of this figure and that the longitudinal dimension will be adjusted by guides **68** and **71**.

It is important that the lower ends of guides **68** through **72** be below the surfaces of strips **46** through **49** to prevent undesired shifting of the stack. In order to accommodate different stack sizes in a transverse direction, strips **46** and **47** are therefore adjustable transversely by means of slots **79** and **81** in plate **37** and adjusting clamps **82** on the strips as seen in FIG. 3.

The means for exactly dividing the group to be counted from the stack comprises a reference finger **83** and a separating wedge **84**, both of which are carried by a bracket **85**. This bracket is located immediately past guide **72** and extends downwardly, its lower end being connected to an actuating link **86**. This link is guided on the side of base **12** by a bracket **87** and carries a shoulder **88**, a coil spring **89** being disposed between bracket **87** and shoulder **88**. The spring urges link **86** to the left in FIG. 1 which in turn will cause support **85** to advance toward stack **53**. A slot **91** is provided in guide **72** to permit finger **83** and wedge **84** to approach the stack.

The means for actuating link **86** comprises a cam **92** on shaft **59** and a cam follower **93** on a link **94** pivoted at **95** to base **12**. The upper end of link **94** is connected at **96** to link **86**. The major portion of cam **92** is so formed so that support **85** will be held in its right hand or retracted position as shown in FIG. 1. However, upon cam follower **93** entering portion **97** of cam **92**, support **85** will rapidly approach stack **53** and then be withdrawn therefrom. This will occur, as will be later seen, when platform **18** is withdrawn from the stack which rests on platform **19**.

Means are provided for adjusting the height of separating wedge **84** with respect to reference finger **83**. This means is best shown in FIG. **6** and comprises a pivotal support **98** for wedge **84** and an adjusting screw **99** mounted on support **85**, with a lock nut **101** for holding the wedge in its adjusted position. It will be seen in FIG. **6** that the upper surface of reference finger **83**, which is at approximately the same height as the upper surface of strips **46** to **49**, will accurately locate the underside of stack **53** so that when the pointed edge **102** of wedge **84** enters the stack, it will separate a group **103** which has an accurately counted number of sheets. As wedge **84** holds the group separated in this fashion, the leading corner **22** of platform **18** will enter this separation and continue to move into the stack as the finger and wedge are withdrawn. Group **103** will thus pass downwardly through the space between platforms **18** and **19**.

Means are provided for receiving the separated group **103** and delivering it to a pickup point. In the illustrated embodiment, this means comprises three bars **104**, **105** and **106** which are secured to the inner end of platform **19** and extend under platform **18**. The group of sheets **103** dropping onto these bars will be carried toward the exit end of machine **11** where it may be picked up by any appropriate means (not shown).

To summarize the operation of the mechanism, assuming an initial condition in which platform **18** is supporting stack **53**, finger **83** and wedge **84** will be in their retracted positions. As carriage **15** advances to the right toward the solid line position of FIG. **1**, platform **18** will slide out from under the stack which will then drop onto platform **19**. At this point platform **18**, including its leading corner **22**, will be completely clear of the stack.

While in this position, reference finger **83** and seperating wedge **84** will rapidly advance toward the stack and will separate it from a corner of group **103**, as seen in FIG. **6**. With the corner of the stack held in separated position, the carriage will begin its return movement to the left in FIG. **1**. Corner **22** of platform **18** will enter at the point of separation and will begin to separate the remainder of group **103** which rests on platform **19**, the entire stack, including group **103**, being held against horizontal movement by guides **68** through **72**. As carriage **15** continues to move to the left, platform **18** will enter between stack **53** and group **103**. Stack **103** will still be retained by guides **68** through **72**, and platform **19** will therefore slide out from under group **103**, this group dropping onto delivery bars **104**, **105** and **106**. Meanwhile the remainder of the stack **53** will again rest on platform **18**.

Upon the next rightward movement of carriage **15** in FIG. **1**, group **103** which is resting on the delivery bars will be carried to the right to be picked up. Meanwhile, platform **18** will again be withdrawn from the underside of stack **53** which will drop onto platform **19**, and the cycle will be repeated.

What is claimed is:

1. In a mechanism for dividing a stack of sheets into groups of predetermined count, a base, a carriage reciprocably mounted on said base, said carriage having longitudinally spaced upper and lower platforms, guides mounted above said carriage and holding a stack of sheets in position whereby horizontal shifting of the stack is prevented, the carriage being movable between a first position in which the upper platform supports said stack and a second position in which the lower platform supports the stack, and dividing means separate from and narrower than said platforms, said dividing means being actuatable in response to arrival of said lower platform beneath said stack for separating a portion of a group of sheets of predetermined count from the lower end of said stack, said upper platform being so shaped as to enter between said stack and group at said separated portion upon return movement of said carriage to its first position and continue to enter between the stack and group, whereby the group will become separated from the stack and dropped below the upper platform.

2. The combination according to claim **1**, further provided with means for vertically adjusting the height of one of said platforms.

3. The combination according to claim **2**, said height adjusting means being for said lower platform.

4. The combination according to claim **3**, said lower platform comprising a base and a plate above said base, said height adjusting means comprising rotatable eccentric members connecting said plate and base.

5. The combination according to claim **1**, said dividing means being located at one corner of said stack at

the end of the machine toward which said group is delivered, said upper platform having an inclined inner edge whereby the forward corner thereof will enter at said corner of the stack.

6. The combination according to claim 1, said dividing means comprising a reference finger reciprocably mounted at one corner of said stack, a separating wedge mounted above said finger, and means for adjusting the distance between said finger and wedge.

7. The combination according to claim 1, said stack guiding means comprising three adjustable guides at three corners of said stack and a fixed guide in the fourth corner, said stack dividing means comprising a reference finger and a separating wedge at said fourth corner, said reference finger being engageable with the underside of the stack, and means for adjusting the height of the separating wedge with respect to the reference finger.

8. The combination according to claim 1, further provided with delivery means on said carriage for receiving said dropped group, whereby the group will be delivered to a pick-up point upon the next movement of said carriage from its first to its second position.

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