Nov. 6, 1962 D. N. OBENSHAIN 3,062,539

JOGGING DEVICE

Filed Aug. 24, 1960 3 Sheets-Sheet 1

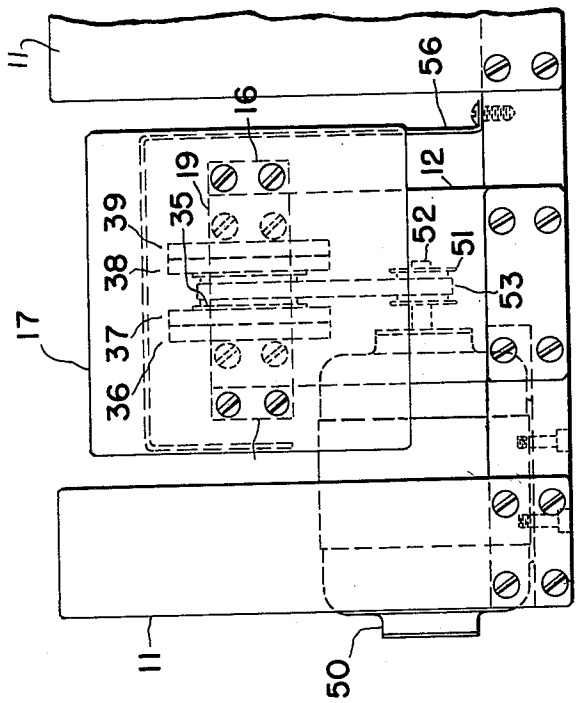


Fig. 2

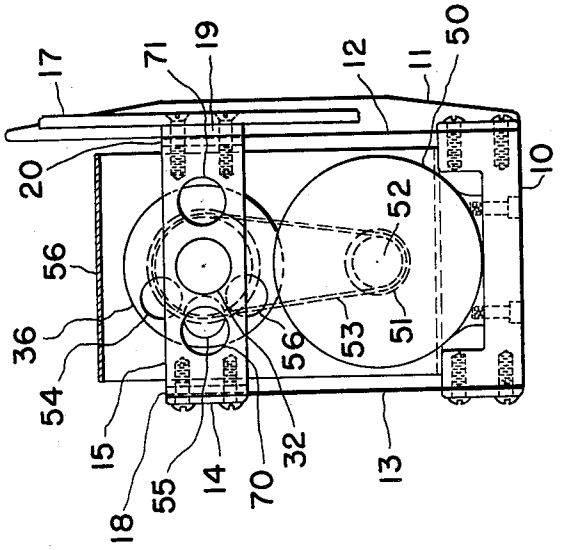


Fig. 1

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JOGGING DEVICE

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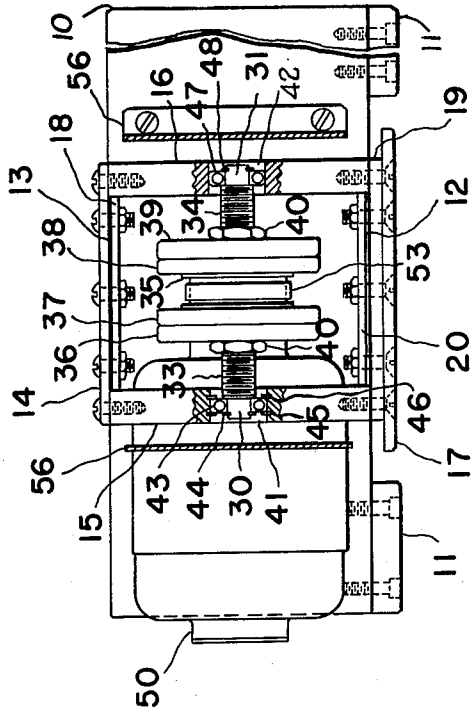


Fig. 3

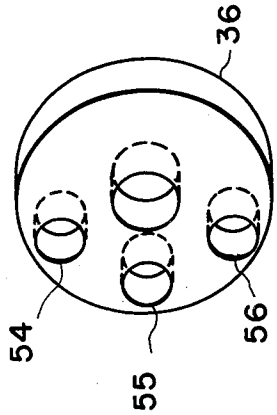


Fig. 4

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JOGGING DEVICE

Filed Aug. 24, 1960 3 Sheets-Sheet 3

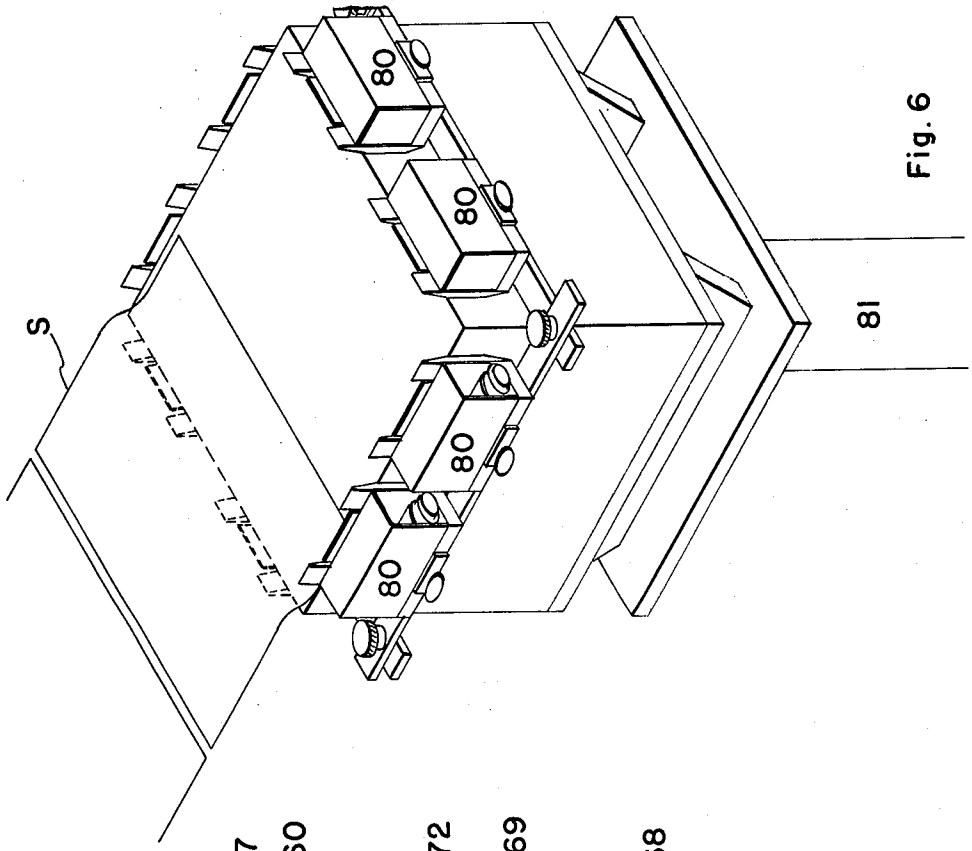


Fig. 6

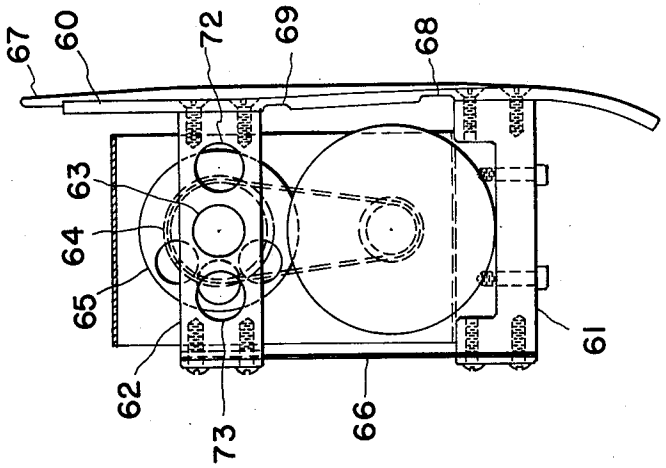


Fig. 5

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3,062,539

JOGGING DEVICE

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Filed Aug. 24, 1960, Ser. No. 51,677
15 Claims. (Cl. 271—89)

This invention relates to vibratory apparatus for bringing the edges of a group of sheets of material into registry. More particularly, it relates to a mechanical jogger for jogging sheets of paper into an aligned stack.

In general, this invention provides for a jogging device which may be used in combination with any suitable source of sheet material supply, and it finds special utility in the field of stacking paper received from such devices as web cutters or printing presses and the like.

The invention also provides for a mechanical jogger which quickly aligns sheets of paper as received at the top of a stack into registry with the edges of the stack.

The jogging device provides a paddle for jogging the sheets of paper as they are received. The vibratory motion of the paddle is created by oscillation of a bearing assembly mounted on leaf springs and vibrated through the action of eccentric weights driven by suitable power means. The vibratory motion of the paddle is extremely rapid, and the patting action of the paddle upon the edges of the sheets of paper received at the top of the stack serves to align the edges of these sheets with those already comprising the stack. The stack is preferably lowered by any suitable means to keep the top of the stack at a relatively constant level as additional sheets are supplied to the stack.

Other features of the invention will be apparent from the following detailed description and drawing forming part of this specification.

FIGURE 1 is a side sectional view of the preferred embodiment of the present invention;

FIGURE 2 is a front view of the apparatus shown in FIGURE 1;

FIGURE 3 is a top view of the preferred embodiment of the present invention;

FIGURE 4 is an oblique view of one of the eccentric discs forming part of the present invention;

FIGURE 5 is a side sectional view of a further embodiment of the novel jogging device;

FIGURE 6 is a perspective view of the novel jogging device during an illustrative stacking operation.

A preferred embodiment of the mechanical jogging device of the present invention is shown in FIGURES 1 to 4. The base of the device includes a plate-like body **10** supporting paper guides **11** and front and back leaf springs **12** and **13** mounted at right angles to the base member **10**. Leaf springs **12** and **13** serve to flexibly support bearing plates **15** and **16**, and jogging paddle **17**. Rear leaf spring **13** is mounted between back end plate **14** and retaining plate **18**, and back end plate **14** is rigidly attached at each end to bearing plates **15** and **16**. Front leaf spring **12** is mounted similarly between front end plate **19** and retaining plate **20**. Jogger paddle **17** is suitably fastened to front end plate **19**, leaf spring **12**, and retaining plate **20**, and front end plate **19** is rigidly attached at each end to bearing plates **15** and **16**. The rectangular structure formed by bearing plates **15** and **16**, front and back end plates **19** and **14**, lies in a plane which is parallel to the plane of the base member **10** and flexibly supported above the base member **10** by leaf springs **12** and **13**.

Front and back end plates **19** and **14** and the retaining plates **18** and **20** may be omitted, and the spring leaves **12** and **13** may be attached directly to the ends of the

bearing plates **15** and **16**. The jogging paddle **17** is then fastened to leaf spring **12**. However, in the preferred embodiment of the invention, the end plates and retaining plates are employed as shown in FIGURES 1 and 3.

The bearing plates **15** and **16** serve to house the ends **30** and **31** of spindle **32** having threaded portions **33** and **34**. Timing belt pulley **35** is mounted concentric with spindle **32** mid-way between the ends of spindle **32**. Eccentric discs **36**, **37**, **38**, and **39** are also concentrically mounted on spindle **32** with discs **37** and **38** positioned immediately adjacent each side of pulley **35**. Lock nuts **40** serve to lock the eccentric discs **36**, **37**, **38**, and **39** and pulley **35** to prevent slippage along the longitudinal axis of spindle **32**. The ends **30** and **31** of spindle **32** are suitably housed within bearing blocks **41** and **42** of bearing plates **15** and **16**. Ball bearing **43** is retained on the spindle end **30** by snap ring **44**, and ball bearing **43** is retained within the bearing block **41** by snap rings **45** and **46**. Ball bearing **47** is retained on spindle end **31** by snap ring **48**.

An electric motor **50** is mounted on the base member **10** and has a drive pulley **51** fast on shaft **52**. A timing belt **53** over drive pulley **51** drives pulley **35** mounted on spindle **32** to rotate the latter and eccentric discs **36**, **37**, **38**, and **39**. In the preferred embodiment, motor **50** rotates drive pulley **51** at about 1725 r.p.m., and a two to one reduction from drive pulley **51** to pulley **35** has been employed to rotate pulley **35** at about 862 r.p.m., and to provide paddle **17** with a vibrating frequency of about 862 strokes per minute. However, a greater or lesser frequency of vibration may be desirable, and to this end, frequencies of from 150 to 2000 strokes per minute have been employed satisfactorily, depending upon the type of jogging action required.

Eccentric discs **36**, **37**, **38**, and **39**, mounted through their center onto spindle **32**, are preferably all the same in weight and size. Brass discs have been employed and have been bored out as shown in FIGURE 4 to provide an uneven weight distribution about their centers. The discs have been paired on either side of pulley **35**, and it is through this pairing that proper vibratory motion is supplied to paddle **17**. As spindle **32** rotates and carries the eccentric discs, a vibratory motion is provided to spring leaves **12** and **13** which, in turn, causes the rectangular structure of bearing plates **15** and **16**, front and back end plates **19** and **14** to vibrate and provide such motion to jogging paddle **17**.

The inside discs **37** and **38** are positioned on spindle **32** such that the three holes **54**, **55**, and **56** of each of the discs are spaced adjacent each other and axially thereof. These two discs always remain in this relationship. Discs **36** and **39**, the outside discs of each pair, control the amplitude of the to and fro motion of the jogger paddle through their angular relation to each of the inside discs **37** and **38**. For example, taking the paired discs **36** and **37**, maximum eccentricity of the pair occurs when disc **36** is positioned with relation to disc **37** such that the three holes **54**, **55**, and **56** of each disc are exactly aligned, and minimum eccentricity is provided when the holes of disc **36** are 180° out of alignment with the holes of disc **37**. The outside disc **39** of the second pair of discs **38** and **39** is positioned about the spindle in exactly the same fashion as disc **36**, such that the holes **54**, **55**, and **56** of disc **39** and disc **36** are in adjacent spaced relationship with each other at all times just as the inside discs **37** and **38** are to each other as previously described.

The importance of employing four such eccentric discs is found in the type of motion provided to the jogging paddle. The paddle vibrates with a simple back and forth (to and fro) stoking motion, which is substantially free of any lateral and rotational motions, forward and

backward of the rest position of the paddle. The use of four discs as described above prevents rotational motion about the vertical axis passing through the center of pulley **35** and prevents the jamming and wear on bearings **43** and **47** which would occur should such motion be allowed. Eccentric members other than discs may be employed in the above fashion to provide the type of motion described.

The rapidity of the vibrating motion of the jogging paddle and the ease of control of the amplitude of such motion provides my novel jogging device with the ability to handle many sizes of paper sheets and stack them uniformly. The unit may be mounted in any suitable position, as for example as shown in FIGURE 6, and the unrestricted mobility of the device lends greatly to its usefulness. Several such devices have been used to stack paper sheets with measurements as large as 56 x 77 inches very satisfactorily with an arrangement similar to that shown in FIGURE 6 in which paper sheets S are jogged into registry with the stack through the combined jogging action of several devices according to the present invention. The joggers **80** are arranged with two joggers per stack side. A hydraulic lift **81** has been shown as a means to keep the top of the stack at a relatively constant level.

In some instances the variable amplitude feature may not be required and a single pair of discs of proper unbalance may be employed, one on either side of the pulley **35**.

The paper guides **11** on either side of the jogging paddle **17** may be used as desired, and I have found their use preferable. They function not only to act as a stop and guide for paper sheets delivered to the top of the stack, but they also act to prevent binding of the jogging paddle due to the weight of a group of sheets overcoming the vibrating action of the paddle. As shown in FIGURE 1, the paper guides **11** extend about 3/32 inch in front of paddle **17** when the latter is in the rest position. At the lowest amplitude of vibration provided with my device, the paddle vibrates at least this distance forward from the rest position to strike the edges of the paper sheets collected.

A protective cover **56** is provided, as shown in FIGURES 1 and 2, and is mounted to base **10** to shield the eccentric discs and spindle. The cover **56** is positioned such that when the jogging paddle **17** vibrates at the greates amplitude, said paddle does not contact the top portion of the cover.

The material for the spring leaves employed is spring steel of .020 inch thickness, and each spring has the dimensions 5½ x 3 inches. Any other suitable flexible material may also be used.

The jogging paddle shown in FIGURE 1 is a nylon plate having dimensions 5 x 5 x 3/16 inches. Stainless steel plates have also been employed, and any suitable material, metal or plastic and the like, may also be used.

A further embodiment of my invention is shown in FIGURE 5, and differs from FIGURE 1 in that one of the leaf springs has been replaced with a paddle **60** made of flexible material and attached directly to base member **61** and bearing plates **62**. The bearing plates, carrying a spindle **63** upon which are mounted a pulley **64** and eccentric discs **65**, are suspended above the base member **61** by leaf spring **66** and paddle **60**. Rotation of the spindle and eccentric discs provides for a vibrating motion of the flexible paddle as previously described for the preferred embodiment. Paper guides **67** have been provided on each side of paddle **60** to stop the sheets of paper when received on the stack and to prevent binding of the paddle. The jogging paddle **60** is preferably offset slightly from the vertical plane of the paper guides **67** to allow for greater surface of the paddle **60** to engage sheets of material as they are received for stacking.

Nylon paddles of dimensions 8 x 4 x 3/16 inches have been employed satisfactorily in this manner. Portions of the paddle have been grooved out at **68** and **69** to widths of 3/32 inch to allow for greater flexibility at these hinge points. The jogging action provided with this embodiment is very much similar to that of the device shown in FIGURES 1 to 4. While nylon paddles have been used exclusively in this arrangement, any other flexible material, plastic or metal, could be employed.

It has been found desirable to keep the mass of the bearing plates to a minimum in order to achieve ample vibratory motion of the jogging paddle. As shown in the drawings, the bearing plates have been lightened in mass by boring holes **70** and **71** in plates **15** and **16** of FIGURE 1 and holes **72** and **73** in plates **62** of FIGURE 5. Steel bearing plates of dimensions 3¼ x 1¼ x ½ inches have been employed satisfactorily. Lighter materials could be employed without the necessity of boring them out.

In the embodiments shown in the drawing, an electric motor has been used to drive two pulleys linked by a timing belt to rotate the eccentric carrying spindle. However, the drive from the motor to the spindle may be accomplished by any other suitable means.

While certain embodiments of the invention have been illustrated and described, it is to be understood that various changes may be made therein and the invention embodied in other structures, and it is not intended to limit the patent to the specific constructions illustrated.

I claim:

1. A jogging device for positioning sheet material in continuous stacking operations comprising, in combination, a base, front and back spring leaves attached at their lower ends to opposite sides of the base, front and back end plates attached respectively to the upper ends of the front and back spring leaves, bearing plates mounted parallel to the base and attached to the front and back end plates, said bearing plates meeting the end plates at right angles, a sheet engaging jogging paddle attached exteriorly to the front end plate and parallel to the spring leaves, sheet guides mounted on the base spaced at each side of the front spring leaf, paired eccentric discs mounted on a spindle supported at its ends by the bearing plates and suspended therebetween, and means for rotating the eccentric carrying spindle to vibrate the spring leaves in unison with a simple back and forth motion substantially free of lateral and rotational motions, whereby said sheet engaging jogging paddle attached to the front end plate carried by the front spring leaf is also vibrated with a simple back and forth motion substantially free of lateral and rotational motions.

2. A sheet jogging device comprising, in combination, a base member, a flexible spring member attached at one end to the base, a flexible jogging member attached directly to said base member opposite the flexible spring member, bearing members mounted above the base member and supported by the flexible spring and jogging members, eccentric members mounted on a spindle supported by the bearing members, and means for rotating the eccentric carrying spindle.

3. A jogging device for positioning sheet material in continuous sheet stacking operations comprising, in combination, a base, a spring leaf attached at one end to a side of the base, a flexible sheet engaging jogging paddle attached to a side of the base opposite said spring leaf, bearing plates mounted parallel to the base and supported by the spring leaf and the jogging paddle, paired eccentric discs mounted on a spindle supported at its ends by the bearing plates and suspended therebetween, and means for rotating the eccentric carrying spindle to vibrate the spring leaf and jogging paddle in unison with a simple back and forth motion substantially free of lateral and rotational motions.

4. As in claim 3 in which the eccentric discs have a plurality of holes spaced in one-half of their surfaces, whereby the amplitude of vibration of the spring leaf and

jogging paddle is controlled by rotatably adjusting the alignment of the holes in each of the paired eccentric discs, said amplitude of vibration being greatest when the holes in each of the paired eccentric discs are exactly aligned, and said amplitude of vibration decreasing as the holes in each of the paired eccentric discs become increasingly disaligned.

5. As in claim 3 in which the frequency of vibration of the jogging paddle is in the range of 150 to 2000 strokes per minute.

6. A jogging device for positioning sheet material in continuous sheet stacking operations comprising, in combination, a base, a spring leaf attached at one end to a side of the base, a flexible sheet engaging jogging paddle attached to a side of the base opposite said spring leaf, sheet guides mounted on the base spaced at each side of the jogging paddle, bearing plates mounted above the base and supported by the spring leaf and jogging paddle, paired rotatably adjustable eccentric discs having a plurality of holes spaced in one-half of their surfaces mounted on a spindle supported by the bearing plates, and means for rotating the eccentric carrying spindle to vibrate the spring leaf and jogging paddle in unison with a simple back and forth motion substantially free of lateral and rotational motions, whereby the frequency of vibration of the jogging paddle is in the range of 150 to 2000 strokes per minute and the amplitude of vibration of said jogging paddle is controlled by rotatably adjusting the alignment of the holes in each of the paired eccentric discs, said amplitude of vibration being greatest when the holes in each of the paired eccentric discs are exactly aligned, and said amplitude of vibration decreasing as the holes in each of the paired eccentric discs become increasingly disaligned.

7. In a jogging device, a base, a flexible jogging member attached directly to said base, a flexible spring member attached at one end to said base opposite the flexible jogging member, means supported by the jogging member and spring member for imparting a vibrational motion alternately in opposite directions to said jogging member and said spring member, and means for driving said motion imparting means.

8. A jogging device as defined by claim 7 in which the motion imparting means comprises a rotatable shaft, paired eccentric members mounted on said shaft, and bearing members at each end of said shaft.

9. A sheet jogging device comprising, in combination, a base, front and back flexible support members attached at their lower ends to two opposite sides of the base and parallel to each other, bearing members mounted above the base and supported by the front and back flexible support members, sheet jogging means attached exteriorly to the front flexible support member and parallel thereto, eccentric members mounted on a spindle supported at its ends by the bearing members and suspended therebetween, and means for rotating the eccentric carrying spindle to vibrate the flexible support members in unison with a simple back and forth motion substantially free of lateral and rotational motions, whereby said sheet jogging means attached to the front flexible support member is also vibrated with a simple back and forth motion substantially free of lateral and rotational motions.

10. A sheet jogging device comprising, in combination, a base, front and back flexible support members attached at their lower ends to two opposite sides of the base and parallel to each other, bearing members mounted above the base and supported by the front and back flexible support members, sheet jogging means attached exteriorly to the front flexible support member and parallel thereto, sheet guides mounted on the base spaced at each side of the front flexible support member, eccentric members mounted on a spindle supported at its ends by the bearing members and suspended therebetween, and means for rotating the eccentric carrying spindle to vibrate the flexible support members in unison with a simple back and forth motion substantially free of lateral and rotational motions, whereby said sheet jogging means attached to the front flexible support member is also vibrated with a simple back and forth motion substantially free of lateral and rotational motions.

11. A jogging device for positioning sheet material in continuous sheet stacking operations, comprising, in combination, a base, front and back spring leaves attached at their lower ends to two opposite sides of the base, front and back end plates attached respectively to the upper ends of the front and back spring leaves, bearing plates mounted parallel to the base and attached to the front and back end plates, a sheet jogging paddle attached exteriorly to the front end plate and parallel to the spring leaves, eccentric members mounted on a spindle supported at its ends by the bearing plates and suspended therebetween, and means for rotating the eccentric carrying spindle to vibrate the spring leaves in unison with a simple back and forth motion substantially free of lateral and rotational motions, whereby said sheet jogging paddle attached to the front end plate carried by the front spring leaf is also vibrated with a simple back and forth motion substantially free of lateral and rotational motions.

12. A sheet jogging device as in claim 1 in which the frequency of vibration of the sheet jogging paddle is in the range of 150 to 2000 strokes per minute.

13. A jogging device for positioning sheet material in continuous sheet stacking operations comprising, in combination, a base, front and back spring leaves attached at their lower ends to two opposite sides of the base, front and back end plates attached respectively to the upper ends of the front and back spring leaves, bearing plates mounted parallel to the base and attached to the front and back end plates, a sheet engaging jogging paddle attached exteriorly to the front end plate and parallel to the spring leaves, sheet guides mounted on the base spaced at each side of the front spring leaf, paired rotatably adjustable eccentric discs having a plurality of holes spaced in one-half of their surfaces mounted on a spindle supported at its ends by the bearing plates and suspended therebetween, and means for rotating the eccentric carrying spindle to vibrate the spring leaves and jogging paddle in unison with a simple back and forth motion substantially free of lateral and rotational motions, whereby the amplitude of vibration of the spring leaves and jogging paddle is controlled by rotatably adjusting the alignment of holes in each of the paired eccentric discs, said amplitude of vibration being greatest when the holes in each of the paired discs are exactly aligned, and said amplitude of vibration decreasing as the holes in each of the paired eccentric discs become increasingly disaligned.

14. In a jogging device, a base, front and back spring leaves mounted at their lower ends on two opposite sides of the base and parallel to each other, a sheet jogging member attached exteriorly to the front spring leaf, means supported by the spring leaves above the base to vibrate the spring leaves in unison with a vibrational motion alternately in opposite directions, and means for driving said motion imparting means, whereby said sheet jogging member attached to the front spring leaf is also imparted with a vibrational motion alternately in opposite directions.

15. A jogging device as defined by claim 13 in which the motion imparting means comprises a rotatable shaft, paired eccentric members mounted on said shaft, and bearing members at each end of said shaft.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,062,539 November 6, 1962

David Noel Obenshain

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 63, for the claim reference numeral "13" read -- 14 --.

Signed and sealed this 21st day of May 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents