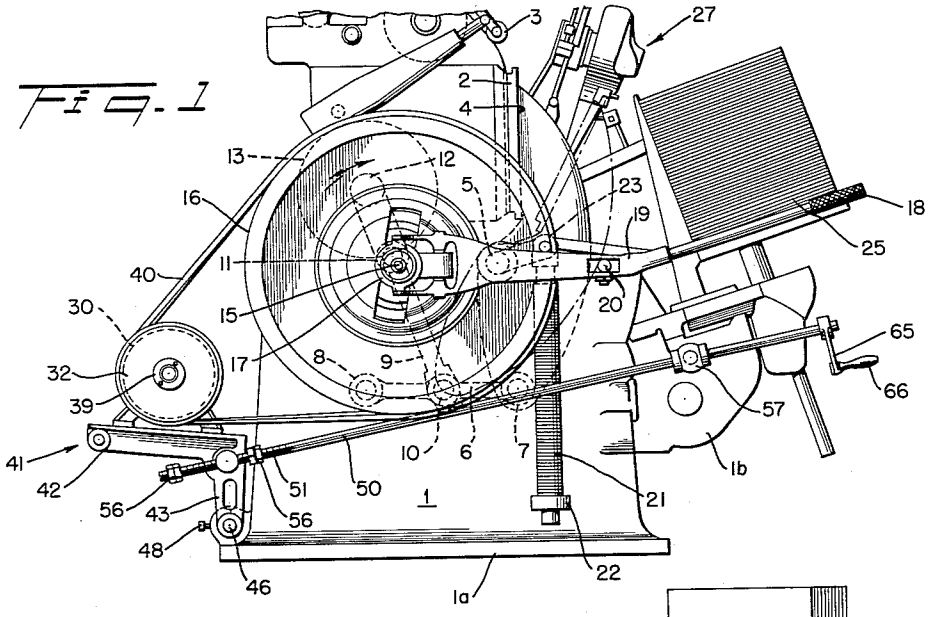
Dec. 13, 1960 A. M. BÜTTNER 2,963,966

VARIABLE SPEED PLATEN PRINTING PRESS

Filed Oct. 11, 1957 2 Sheets-Sheet 1

Fig. 1



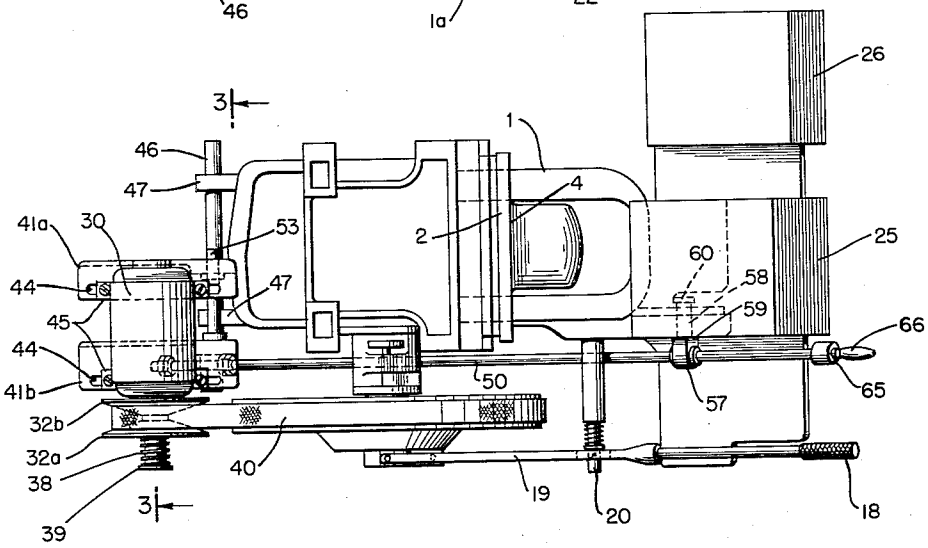


Fig. 2

Dec. 13, 1960 A. M. BÜTTNER 2,963,966

VARIABLE SPEED PLATEN PRINTING PRESS

Filed Oct. 11, 1957 2 Sheets-Sheet 2

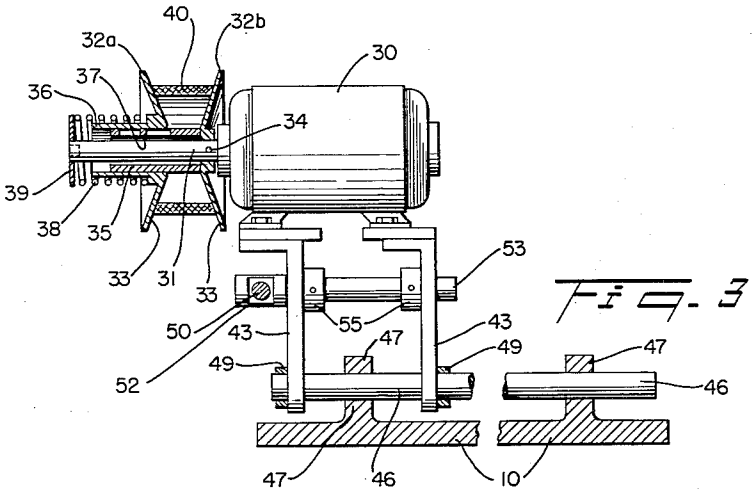


Fig. 3

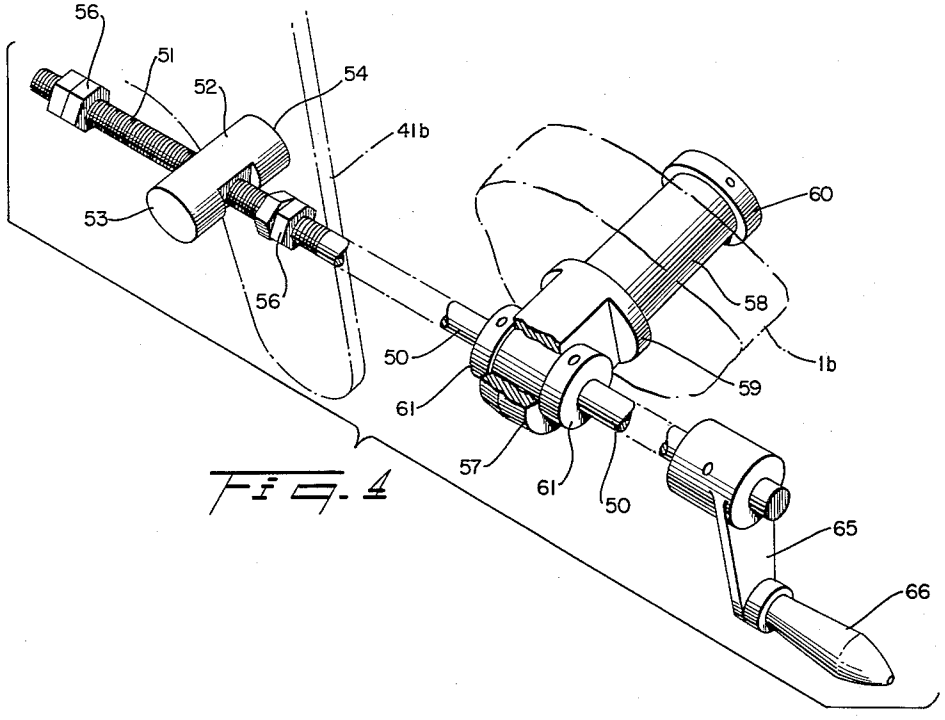


Fig. 4

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2,963,966

VARIABLE SPEED PLATEN PRINTING PRESS

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4 Claims. (Cl. 101—287)

The present invention relates to platen-type printing presses and particularly to means for varying the speed of operation of such presses. This application is a continuation-in-part of my application, Serial No. 172,407, filed July 7, 1950, now abandoned.

A platen printing press customarily has a type bed supported on a rigid frame and a platen that is oscillatable about a fixed axis between a printing position in engagement with type held by the type bed and a forward or open position in which paper stock to be printed is fed to and removed from the platen. Oscillation of the platen is effected by a crank and toggle mechanism driven from a main drive shaft rotatably supported by the frame and carrying a drive wheel which is usually a heavy flywheel at the side of the press. The flywheel is driven by a belt from a motor at the rear of the press. Paper being printed is fed to and removed from the platen at a feed station at the front of the press. In an automatic press, feed mechanism is provided for taking sheets of paper from a feed table, positioning them on the platen and then removing the printed sheets from the platen and depositing them on a delivery table. An operator running the press stands in front of it where he can observe and control the feed delivery of paper, the inking of the type and the operation of the platen, and can check the printed sheets coming from the press to see that they are correctly printed.

It is desirable to provide means for varying the speed of a platen press so that it can be operated at different speeds according to the work being performed. Moreover, it is desirable to have the speed controllable by an operator stationed at the front of the press. For example in starting up new work, the press is preferably started at low speed. When the operator sees that everything is functioning correctly and he is getting good impressions, it is desirable to speed the press up to increase its production. However, the provision of a variable speed drive controllable from the front of the press presents difficult problems. Because of its simplicity and reliability, it is desirable to use a constant speed electric motor. Moreover, it is not practical to mount the motor at the front of the machine adjacent the operator's position. To provide satisfactory press operation, the speed ratios must be continuously variable over a wide range without interruption of driving effort. This eliminates the use of gear shift transmissions. While continuously variable belt drives are known, they are customarily controllable from a point near the motor and transmission. The problem of controlling such a transmission from the front of the press is complicated by the fact that the speed ratio of such transmissions is subject to variation by changes in load resistance and by shock or vibration.

It is accordingly an object of the present invention to overcome the problems referred to above and provide a platen-type printing press with a continuously variable speed drive controllable by the operator from his normal position at the front of the press. A further object of

the invention is to avoid fluctuation in speed ratio by reason of the intermittent shock resulting from impact of the platen with the type in the press bed. In accordance with the present invention, these objects are effectively achieved by a simple, economical and reliable construction.

The objects, characteristics and advantages of the present invention will be more fully understood from the following description and claims in conjunction with the accompanying drawings in which:

Fig. 1 is a side view of a platen printing press embodying the present invention.

Fig. 2 is a plan of the press.

Fig. 3 is a vertical section taken approximately on the line 3—3 of Fig. 2.

Fig. 4 is a schematic perspective view showing a portion of the speed control mechanism.

The platen printing press shown by way of example in the drawings has a heavy rugged frame **1** with a flanged base portion **1***a* adapted to be bolted or otherwise securely mounted on a solid foundation or other support. The frame **1** is preferably a steel casting or other construction capable of taking heavy loads and withstanding repeated shock. On the upper part of the frame, there is provided a forwardly facing type bed or chase **2** adapted to receive the type which may be in the form of set type, a plate, block or other desired form. Automatic inking mechanism **3** is provided for applying ink to the type. A platen **4** is oscillatable about a heavy horizontal pivot shaft **5** between a printing position in which the platen is pressed against type held in the type bed **2** and a forward or open position as indicated schematically by broken lines in Fig. 1. Oscillation of the platen is effected by a toggle **6** acting between a toggle pin **7** at the lower end of the platen and a pivot **8**. A connecting rod **9** is connected at one end to a central joint **10** of the toggle and at the other end to a crank **11** of a crank shaft **12** which is rotatably supported by the frame **1**. A gear **13** fixed on the crank shaft **12** meshes with a pinion on a drive shaft **15** which is parallel to the crank shaft and is likewise rotatably supported by the frame **1**. The drive shaft **15** carries a drive wheel **16** which is releasably coupled to the drive shaft by a friction clutch **17**. The drive wheel **16** is of large diameter and heavy construction so as to have a high moment of inertia and thus act as a flywheel. The clutch **17** is manually engaged and disengaged by a clutch lever **18** which extends forwardly to the front of the press and is pivotally supported at **19** on a shaft **20** that projects laterally from a forward portion of the frame. The weight of the platen is counterbalanced by a long spring **21** acting between an adjustable support **22** and an arm **23** that projects from the pivot shaft **5** of the platen.

Means is provided at the front of the press for successively feeding sheets of paper or other stock to be printed to the platen when in its forward position and for removing the sheets from the platen after they have been printed. The feeding means is illustrated as comprising a vertically movable feed table **25** and delivery table **26**, a stack of paper being shown on each table. In an automatic press, mechanism is provided for successively feeding sheets of paper from the stack on the feed table **25** to the platen and removing them from the platen after they have been printed and depositing them on the delivery table **26**. Automatic feeding mechanism is illustrated schematically at **27**.

The press is driven by an electric motor **30**, for example an alternating current motor running at substantially constant speed. The motor **30** has a shaft **31** carrying a pulley **32** comprising two pulley halves **32***a* and **32***b*. The pulley halves have conical faces **33** facing one another. One of the pulley halves **32***b* is fixed to the motor shaft **31**, for example by a pin **34**, and has

an axially extending sleeve portion **35** surrounding the motor shaft. The outer pulley half **32***a* has an axially extending sleeve portion **36** that is telescopically slidable on the sleeve portion **35** and has an inwardly projecting pin **37** engaging a longitudinal slot in the sleeve **35** so that the two pulley halves rotate together and with the motor shaft, but the pulley half **32***a* is slidable axially toward and away from the fixed pulley half. A helical compression spring **38** acts between the movable pulley half **32***a* and a plate **39** secured to the end of the motor shaft **31** to exert a selected pressure tending to slide the movable pulley half **32***a* toward the fixed pulley half **32***b*. The motor **30** drives the press by means of a belt **40** which provides a driving connection between the motor pulley **32** and the flywheel **16** of the press. The belt **40** has inclined edge surfaces which engage the conical surfaces of the pulley halves and a flat inner surface which engages the outer peripheral surfaces of the flywheel. As described below, means is provided for mounting the motor **30** on the base of the press so as to be movable toward and away from the flywheel **16**. When the motor together with the pulley **32** is moved away from the flywheel **16**, the belt **40** is drawn closer to the motor shaft **31** and hence engages the conical faces of the pulley halves nearer their axis, the movable pulley half **32***a* being forced away from the fixed pulley half **32***b* sufficiently to accommodate the belt. The effective radius of the pulley **32** is thereby decreased with a resulting decrease in the speed at which the press is driven. Conversely, if the motor **30** is moved toward the flywheel **16**, the spring **38** presses the pulley halves toward one another and the belt **40** is forced outwardly to engage the pulley halves nearer their periphery with a resulting increase in the press speed. The face of the flywheel is sufficiently wide to accommodate any lateral movement of the belt arising from the fact that only one pulley half is movable.

As illustrated in the drawings, the motor **30** is movably supported by a motor mount **41** comprising a pair of angular brackets **41***a* and **41***b*. Each of the brackets comprising the motor support **41** has an approximately horizontal upper arm portion **42** and an approximately vertical downwardly extending lower arm **43**, the two arms thus being approximately perpendicular to one another. The upper arms are provided with longitudinally extending slots **44** to receive bolts **45** which secure the motor **30** to the upper arms **42** in selected position and thereby connect the brackets **41***a* and **41***b* into a rigid structure. The motor support **41** is pivotally mounted on the base portion of the press by a pivot shaft **46** which extends through aligned apertures in the lower end portions of the downwardly projecting bracket arms **43** and bearing eyes **47**, which are a rigid and preferably integral part of the press base **1***a*. The bearing eyes **47** are disposed in the angle between the flanged base portion **1***a* and the upwardly extending portion of the frame **1** and are preferably spaced apart a sufficient distance to provide a solid support for the pivot shaft **46**. Set screws **48** are screwed into tapped holes in the bearing eyes to hold the pivot shaft in fixed position. The lower arms **33** of the motor support are secured in selected position axially of the pivot shaft **46** by collars **49** while being rotatable on the pivot shaft **46** to permit the unit comprising the motor and motor support to rock about the shaft **46** as a pivot. As will be seen in Fig. 1 the motor **30** is movable away from the flywheel **16** by rocking the motor support about the pivot shaft **46** in a counterclockwise direction and conversely is movable toward the flywheel **16** by rocking in a clockwise direction. The pivot shaft **46** and motor shaft **31** are both parallel to the shaft of the flywheel **16**. The motor support and its pivotal mounting are sufficiently strong and rugged to assure maintaining this parallel relationship throughout the range of movement of the motor toward and away from the flywheel to vary the speed of the press as described above.

Control means operable from the front of the press are provided for moving the motor forwardly and rearwadly and holding it securely in selected position. As illustrated in the drawings, the control means comprises a rotatable shaft or spindle **50** that extends forwardly from the motor support to the front of the press. The spindle **50** is preferably inclined upwardly so that its forward end is higher than the rear end and at a convenient height to be reached by an operator standing in front of the press. A rear end portion of the spindle **51** is externally threaded and extends through a transverse threaded bore **52** (Fig. 4) in a shaft **53** which extends through aligned apertures **54** in the motor supporting brackets **41***a* and **41***b*. The apertures for the shaft **53** are located approximately at the junction between the horizontal arms **42** and the downwardly extending vertical arms **43** of the brackets. The shaft **53** is parallel to the pivot shaft **46** and is rotatable relative to the motor support brackets while being held against axial movement for example by collars **55** secured to the shaft **53** for example by set screws. The spindle **50** is perpendicular to the shaft **53** and hence lies in a vertical plane that is perpendicular to the main drive shaft of the press. It extends forwardly from the motor support along one side of the press frame **1**. Near its forward end, the spindle **50** is rotatably supported by a bearing **57** on the end of a stub shaft **58** which extends through and is rotatably supported by a forwardly projecting portion **1***b* of the press frame **1**. The shaft **58** is perpendicular to the axis of the bearing **57** and parallel to the shaft **53**, and is supported by the frame in such a way as to maintain this parallel relationship and to hold the shaft firmly against transverse movement while permitting rotation about its longitudinal axis. A shoulder **59** and removable collar **60** engage opposite faces of the portion of the frame through which the stub shaft extends to hold the shaft against axial movement. Collars **61** secured to the spindle **50** for example, by pins or set screws, engage opposite ends of the bearing **57** to hold the spindle **50** against axial movement relative to the bearing. A suitable hand wheel or crank **65** having a handle **66** is secured to the forward end of the spindle **50** in a position conveniently accessible to an operator standing in front of the press. As will be seen in Fig. 1 the crank **65** is close to the hadle **18** for controlling the clutch that couples the flywheel **16** to the main shaft of the press. Through engagement of the threaded portion **51** of the spindle with the threaded bore **52** of the shaft **53**, said shaft and hence the motor support and motor are moved longitudinally of the spindle when the spindle is rotated. Nuts **56** are set at selected points on the spindle to limit the movement.

The operation of the press and in particular the speed control mechanism will be apparent from the drawings and the foregoing description. Upon rotation of the spindle **50** by the hand crank **65**, the shaft **53** is displaced in one direction or the other by reason of engagement of the threaded bore **52** of the shaft with the threaded portion **51** of the spindle. This in turn causes the motor support **41** to rock about its pivot shaft **46** and thereby move the motor toward and away from the flywheel. When the motor is moved in a direction away from the flywheel, the belt **40** is drawn into engagement with the smaller portions of the conical pulley faces so as to provide a smaller effective pulley radius and thereby decrease the speed at which the flywheel **16** is driven—the motor speed remaining substantially constant. Conversely, when the motor is moved toward the flywheel **16** by rotation of the spindle in the opposite direction, the pulley halves are pressed toward one another by the spring **38** so that the belt engages larger portions of the conical pulley faces to increase the effective radius of the pulley and thereby drive the flywheel at a higher

speed. From Fig. 1 it will be seen that as the motor support rocks about the pivot shaft **46**, the angular relation of the motor support and the spindle **50** necessarily varies. Variation of this angular relationship is permitted by rotation of the shaft **53** in its bearing supports in the motor brackets. Moreover, since the shaft **53** moves in an arcuate path about the pivot axis **46**, the rear end of the spindle **50** is raised or lowered to some extent as the motor support swings forwardly or rearwardly. The raising and lowering of the rear end of the spindle is permitted by rotation of the stub shaft **58** in its bearing support in the press frame. The bearing **57** that supports the forward end portion of the spindle is thus permitted to turn about the axis of the stub shaft **58** so as to remain at all times coaxial with the spindle **50**. The mechanism shown and described thus permits the parts to move freely while at the same time moving parts are made to fit closely without appreciable play.

When the motor **30** has been moved to selected position to provide the desired press speed, it is held firmly and securely in that position. It will be apparent that by reason of the weight of the platen and associated mechanism of the press, the reciprocation or oscillation of these parts subjects the press to vibrational forces particularly when the press is operated at high speeds. Moreover, the press is also subjected to repeated shock when the platen engages the press bed with high pressure. This shock is transmitted back through the drive. Variable speed drives employing conical pulleys are sensitive to shock and vibration. If the reactive torque of the driven machine and hence the tension on the driving side of the belt are increased, the belt tends to pull itself in toward the center of the pulley so as to produce a variation in the speed ratio. Moreover, any vibration of the machine transmitted to the motor mount might cause the motor by its inertia to move toward or away from the driven pulley so as to vary the speed ratio. In the construction according to the present invention, these difficulties are avoided. It will be seen that the motor support **41** is pivotally mounted directly on the rugged frame of the machine adjacent the flanged base portion **1***a* which is secured to a solid foundation. Hence any vibration resulting from oscillation from the platen or other moving portions of the press is not transmitted to the motor. Moreover, the construction of the support and of the control mechanism for moving the motor forwardly and rearwardly to vary the speed of the press assures that the motor is held firmly in selected position. The spindle **50** extends in a straight line between the threaded bore in shaft **53** and the bearing **57** on the forward portion of the press frame. Axial movement of the spindle is prevented by engagement of the collars **51** with opposite ends of the bearing **57**. The direct interengagement between the threaded portion **51** of the spindle and the threaded bore **52** of the shaft **53** avoids slack or play in the connection. Likewise the rotational support of the shaft **53** in the motor support and the stub shaft **58** in the frame permits free movement of the parts and avoids binding while at the same time avoiding play in the connections. Thus the motor is held firmly in selected position and fluctuations in the driving ratio are avoided. The range of speed through which the press is operable is selected and preset by adjustment of the nuts **57**. If any stretching of the belt occurs the stretch can readily be compensated for either by readjusting the nuts **56** or by loosening bolts **55** and moving the motor relative to the motor support (**41***a* and **41***b*), such adjustment being permitted by the elongated slots provided in the motor support brackets.

It will be seen that the construction in accordance with the invention provides for convenient, safe and efficient operation of the press. The controls, including the speed control, are located where they are conveniently accessible to an operator standing at the front of the press where he can watch the entire feeding and printing operation. Thus the speed of the press can be varied while the press is in operation to obtain the best printing speed without requiring the operator to leave his station at the front of the press.

While a preferred embodiment of the invention has been shown in the drawings and particularly described, it will be understood that the invention is not limited to this embodiment and that details of construction may be varied within the scope of the appended claims.

What I claim and desire to secure by Letters Patent is:

1. In an automatic platen-type printing press, a rigid frame having a base portion, a front and a rear, a horizontal drive shaft rotatably supported by the frame intermediate the front and rear, a drive wheel on said shaft, a type bed on said frame and facing forwardly, a platen in front of said bed and supported on said frame for oscillation toward and away from said bed, driving connections between said shaft and said platen to oscillate said platen upon rotation of said drive shaft, paper feed means mounted on the front portion of said frame, a motor having a shaft, means supporting said motor on the rear of the frame for movement forwardly and rearwardly, the shaft of said motor being disposed parallel to said drive shaft, a split pulley on said motor shaft comprising two pulley halves with conical faces facing each other, said pulley halves being secured to rotate with the motor shaft and at least one of said pulley halves being axially slidable on said motor shaft, spring means urging said pulley halves toward one another, a belt engaging the conical faces of said pulley halves and the periphery of said drive wheel to provide a driving connection therebetween and means for moving said motor forwardly and rearwardly to vary the zone of engagement of said belt with said pulley halves and thereby vary the speed of the press, comprising a spindle extending forwardly from said motor supporting means to the front of said frame and having a screw-threaded portion, spindle bearing means rotatably supporting said spindle and comprising respectively a bearing mounted on said motor supporting means and a bearing mounted on the front portion of said frame, said bearings being pivotally mounted to turn on horizontal axes perpendicular to the longitudinal axis of said spindle, one of said bearings having internal threads engaging said threaded portion of the spindle and the other of said bearings supporting said spindle against axial movement whereby rotation of said spindle in one direction moves said motor forwardly to increase the speed of the press and rotation of said spindle in the opposite direction moves said motor rearwardly to decrease the speed of the press, and crank means on the forward end of said spindle adjacent said paper feed means, whereby an operator can change the speed of said press without leaving his operating station at the front of the press, said spindle, bearings, motor supporting means and rigid frame cooperating to hold the motor firmly in selected position despite repeated shock incident to oscillation of said platen and engagement of said platen with type held by said type bed.

2. A printing press according to claim 1, in which said motor supporting means comprises a bell-crank bracket having a lower arm pivotally connected at its lower end to the base portion of said frame and an upper arm extending rearwardly from the upper end of said lower arm, and means mounting said motor on said upper arm.

3. A printing press according to claim 1, in which said spindle bearing means mounted on said motor supporting means comprises a shaft rotatably mounted on said bracket parallel to and above the axis of the pivotal connection of said lower bracket arm to said frame, said shaft having a transverse threaded hole through which the threaded portion of said spindle extends, the threads of said hole mating with the threads on said spindle.

4. A printing press according to claim 1, in which said spindle bearing means on the front portion of the

frame comprises a stub shaft rotatably supported by said frame with its axis perpendicular to the longitudinal axis of said spindle, a sleeve bearing on said stub shaft with its axis perpendicular to the axis of said stub shaft, said spindle extending through and being rotatably supported by said sleeve bearing, and collars fixed on said sleeve and engaging opposite ends of said sleeve bearing to hold said spindle against axial movement.

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