Sept. 13, 1966 W. F. WARD 3,272,047

HYDRAULIC ROLL OSCILLATING DEVICE

Filed Nov. 20, 1963

FIG. 2.

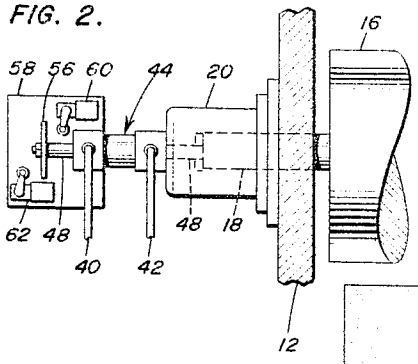


FIG. 1.

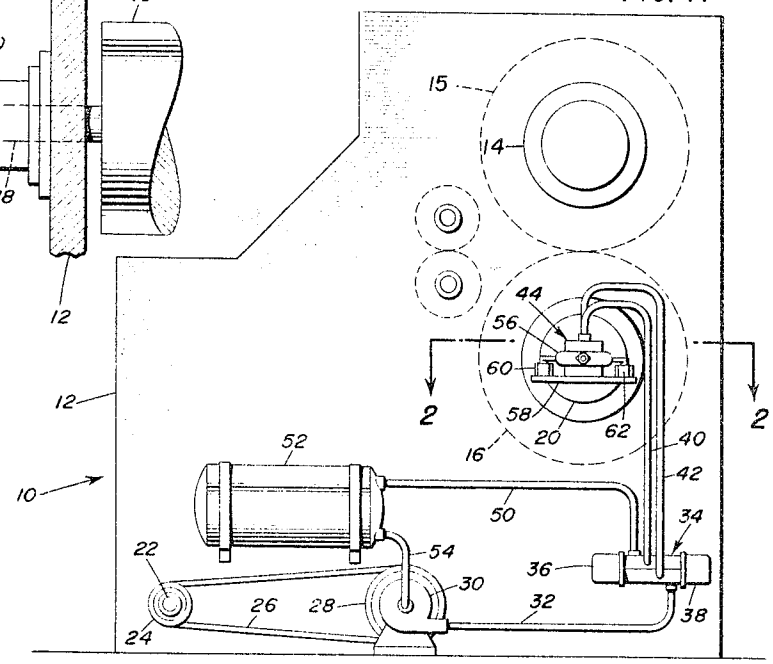
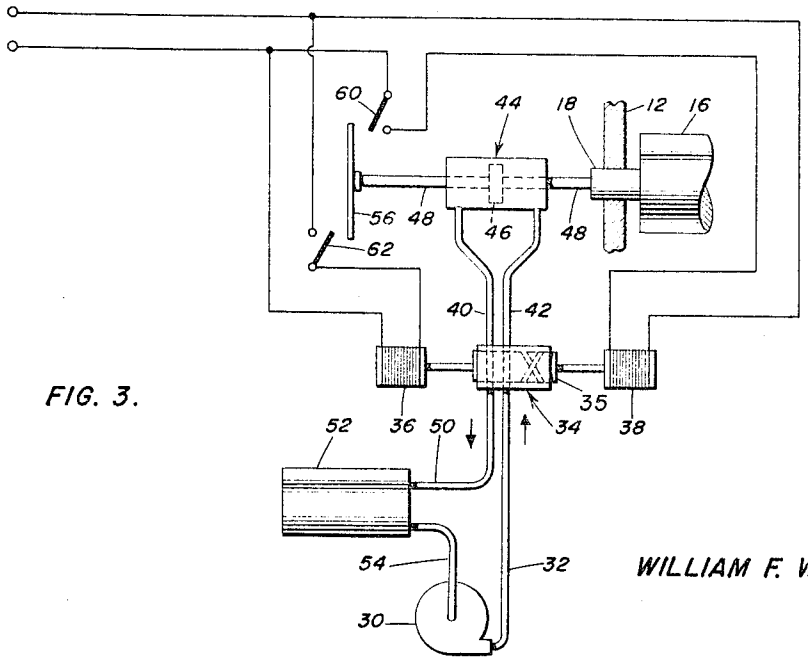


FIG. 3.



WILLIAM F. WARD
INVENTOR

BY Walter J. Finch
ATTORNEY

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HYDRAULIC ROLL OSCILLATING DEVICE

William F. Ward, 1706 Kurtz Ave., Lutherville, Md.

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This invention relates to improvements in apparatus for severing sheet material, and particularly such apparatus wherein severing is obtained by impressing a cutting blade against sheet material which is restrained by a resilient backing member.

A machine operating in this manner is a rotary die-cut machine. In this machine, the resilient backing member is a rotating roll having a resilient covering, such as of polyurethane, and the cutting blade is a serrated blade mounted on another rotating roll and impressed against the surface of the resilient covering. While efficient severing of sheet material, such as cardboard, is obtained, the repetitive impression of the cutting blade on the same line along the surface of the resilient covering results in the damage thereof and to thus require the expense of machine downtime and replacement of the resiliently covered roll.

It is an object of the present invention, therefore, to provide a severing apparatus such as described but with a resilient backing member having extended life.

A further object of the present invention is to provide an arrangement for a resilient backing member in which fresh portions thereof are brought into contact with the cutting blade.

A still further object of the present invention is to provide a mechanism for longitudinally shifting the resilient covered roll in relation to the cutting roll of a rotary die-cut machine.

These and other objects of the present invention will become more readily apparent by reference to the following description and accompanying drawings in which:

FIG. 1 is a side elevation of a rotary die-cut machine incorporating features of the present invention;

FIG. 2 is an enlarged fragmentary view along line 2—2 of FIG. 1; and

FIG. 3 is a schematic diagram of the electric and hydraulic circuitry shown in FIG. 1.

Referring now to FIG. 1, a rotary die-cut machine is generally designated as **10** and it comprises a frame **12**, of which one side only is depicted, and a pair of rolls **14** and **16** rotatably mounted within the frame. Roll **16** is provided with a covering of resilient material and roll **14** is provided with a cutting blade **15** extending from its lateral surface and having its cutting edge impressed against the surface of the resilient covering of roll **16** for severing of sheet material passing between these rolls.

According to the present invention, roll **16** is longitudinally oscillated or shifted with respect to the cutting blade **15** of roll **14** so as to present a fresh resilient surface thereto. This oscillation is obtained by driving the journal shaft **18** of roll **16** in a like motion within journal housing **20** by electric and hydraulic means which will now be described.

An electric motor is provided with its driving shaft **22** having a pulley **24** mounted thereon and a driving belt **26** which, in turn, drives the hydraulic pump **30** by means of a pulley **28**. Hydraulic fluid is supplied to a reversing valve **34** through a pump output line **32**.

As shown in FIG. 3, the reversing valve **34** is provided with a pair of solenoids **36** and **38** and a pair of hydraulic lines **40** and **42**, with the direction of hydraulic fluid flow

through these hydraulic lines **40** and **42** being reversible according to actuation of a slidable valve plug **35** by the solenoids **36** and **38**.

The hydraulic lines **40** and **42** are connected to opposite ends of a double-acting hydraulic cylinder **44** which includes a piston **46** and a piston rod **48** extending from each end of the hydraulic cylinder **44**.

The direction of movement of the piston **46** is determined by which of the hydraulic lines **40** and **42** is supplying hydraulic fluid under pressure to the hydraulic cylinder **44**. The remaining line of the hydraulic lines **40** and **42** is communicated by means of the reversing valve **34** with return hydraulic line **50** and sump **52** which, in turn, supplies hydraulic fluid to the pump **30** through a pump intake line **54**.

The inner end of the piston rod **48** is connected directly to the adjacent end of the shaft **18** of roll **16** so as to translate the longitudinal motion of the piston **46** directly thereto. Reversal of the motion of piston **46** and thus oscillation of roll **16** is obtained by means of a striker plate **56** mounted at the opposite end of the piston rod **48** and a pair of switches **60** and **62** which are positioned upon mounting plate **58**. Mounting plate **58**, in turn, is mounted to the outer end of the hydraulic cylinder of the double-acting hydraulic cylinder **44**.

The switches **60** and **62** are spaced for actuation by the striker plate **56** to determine the limits of its travel and thus the amplitude of oscillation, by means of the electrical connection of the switches **62** and **60** with the solenoids **36** and **38**, respectively, of the reversing valve **34**.

In operation, the longitudinal oscillation of roll **16** is done simultaneously with the passage of sheet material between the rolls **14** and **16**. A representative amplitude of oscillation, as determined by switches **60** and **62**, is 1/16" per revolution of the cycle of the machine so that instead of the cutting blade **15** bearing continuously on a width of the resilient covering corresponding to the width of the cutting blade, the wear of the resilient covering is distributed across the entire amplitude of longitudinal shift.

Obviously many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In a rotary die-cut machine for cutting of sheet material, a pair of rotatably mounted rolls, one of said rolls having a resilient covering and the other of said rolls having cutting means impressed against the surface of said resilient covering for severing of said sheet material when passed between said pair of rolls, a double-acting hydraulic cylinder having one end of its piston shaft connected to one end of the shaft of said one roll for longitudinally oscillating it with respect to said other roll, a source of hydraulic pressure, a pair of hydraulic lines for supplying hydraulic fluid to said hydraulic cylinder, a reversing valve for reversing the direction of hydraulic fluid flow through said hydraulic cylinder to obtain the longitudinal oscillation of said one roll, a pair of spaced switch means for defining the limits of said longitudinal oscillation, striker means mounted on the opposite end of said piston shaft for alternately actuating said spaced switch means, and solenoid means energized by said spaced

switch means to reverse said reversing valve in response to the alternate actuation of said spaced switch means by said striker means.

2. In the rotary die-cut machine of claim 1 wherein said reversing valve includes a slidable valve plug, the sliding movement of which is actuated by said solenoid means.

3. In the rotary die-cut machine of claim 2 wherein said solenoid means consists of a solenoid spaced from each end of said slidable valve plug.

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ANDREW R. JUHASZ, *Primary Examiner.*