Feb. 17, 1959 W. GROBMAN 2,873,968

HYDRAULICALLY LOADED FEED ROLLS FOR CORRUGATED PAPER STOCK

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FIG. 1.

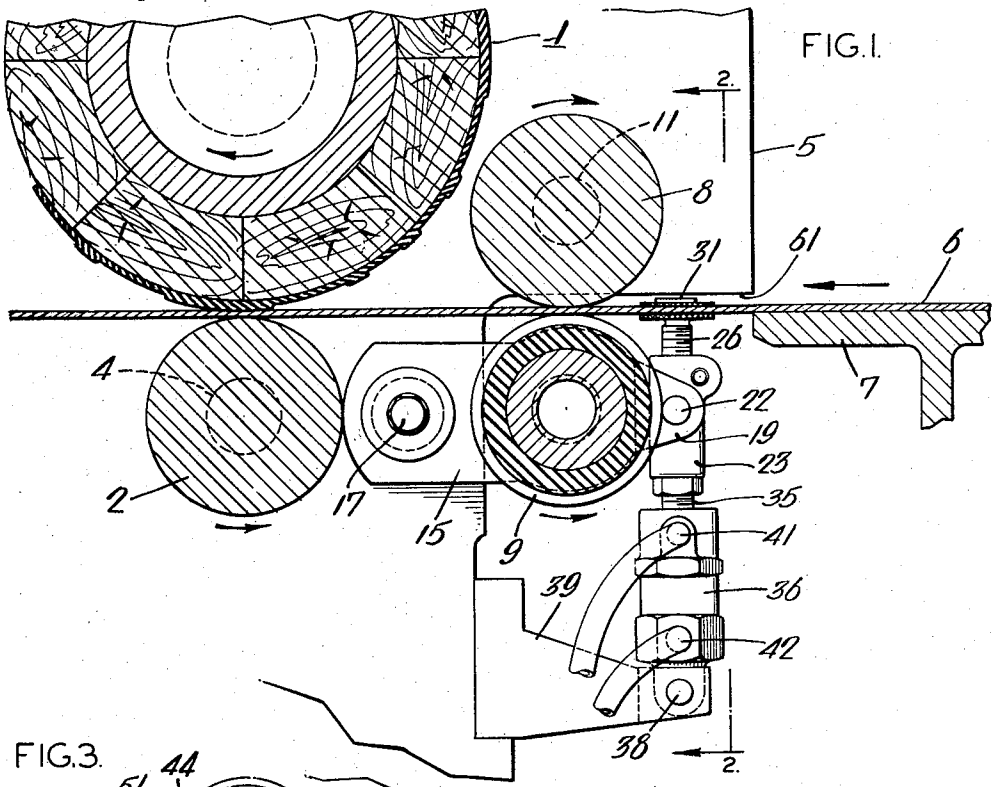


FIG. 3.

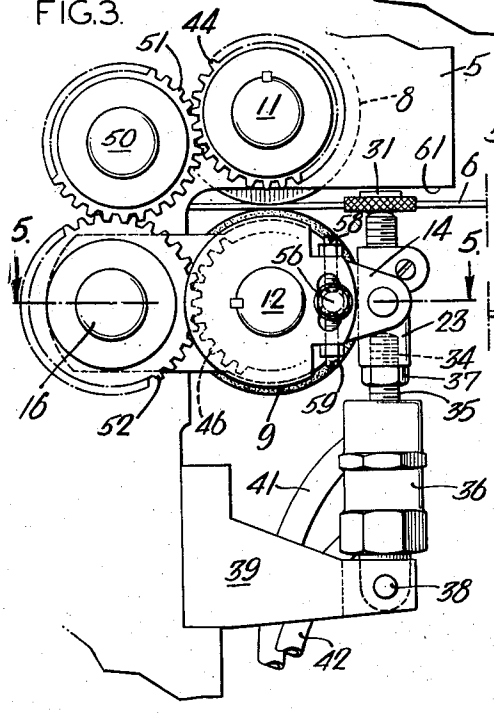
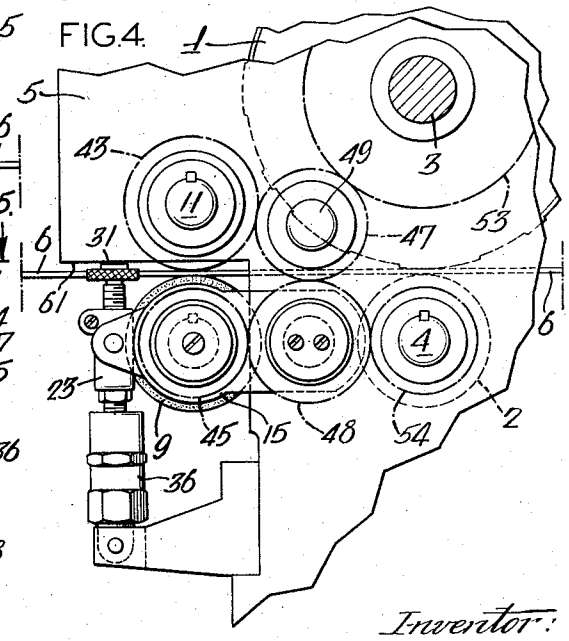


FIG. 4.



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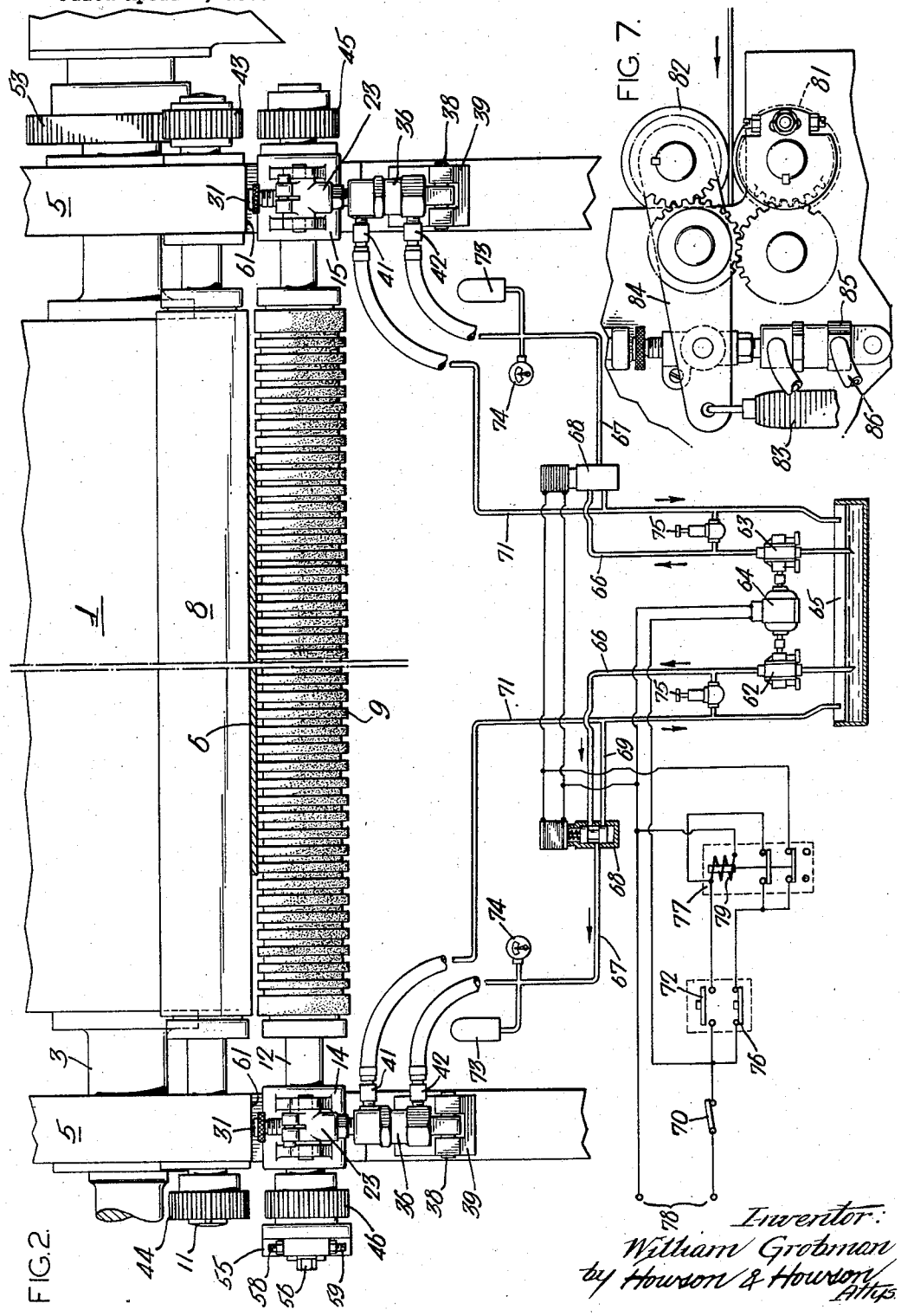


FIG. 2

FIG. 7

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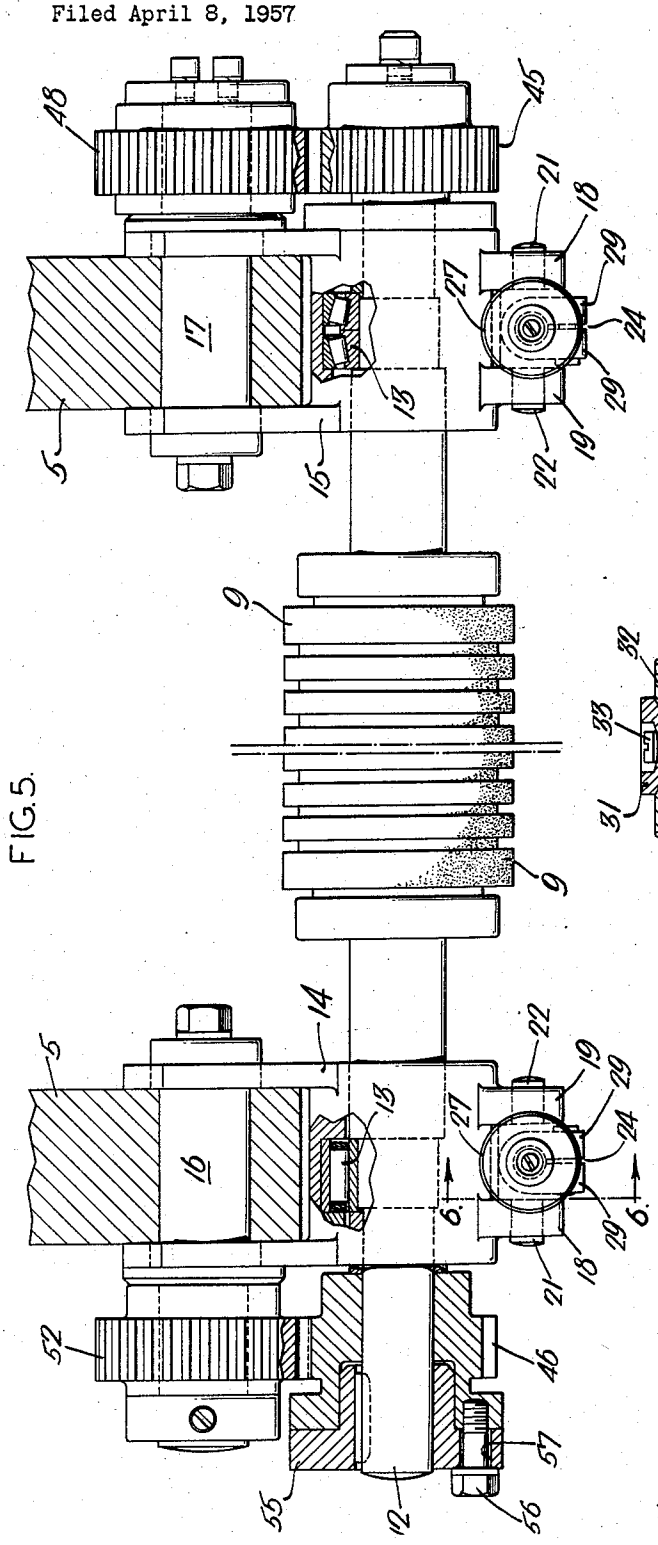


FIG. 5.

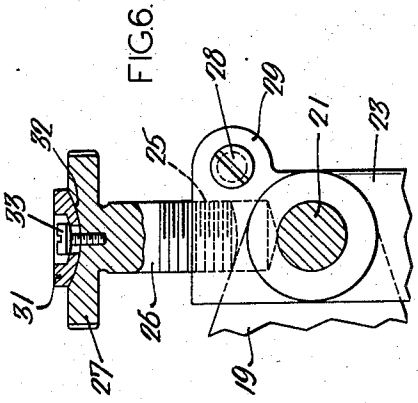


FIG. 6.

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United States Patent Office 2,873,968 Patented Feb. 17, 1959

2,873,968

HYDRAULICALLY LOADED FEED ROLLS FOR CORRUGATED PAPER STOCK

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Application April 8, 1957, Serial No. 651,446

4 Claims. (Cl. 271—51)

This invention relates primarily to machines for performing operations such as printing and slotting on box or like blanks more particularly of corrugated board.

In feeding individual blanks of this character to the rotary printing cylinders or slotting or scoring heads of such machines there are several critical operating requirements. The blanks must be fed, for example, positively in timed relation to the continuous rotary movement of the cylinder or head so that the printed impressions or other work may be uniformly placed on the blanks. Additionally, this positive delivery of the blanks must be effected without imposing pressure on the corrugated stock beyond its capacity to resist crushing. Further, the feed must be of a character capable of accurate adjustment for precise regulation of the amount of pressures and to distribute the pressures uniformly over the blank width, or to afford a calculated inequality of pressures at opposite sides of the blank compensating for lack of uniformity in the latter, so as to maintain the blanks squarely in alignment in their approach to the cylinder or roll. It is important also that the feeding pressures imposed on blanks of any given character be maintained uniform at the predetermined value or values regardless of minor inequalities in the dimensions or physical state of the blanks.

It is a primary object of the invention to provide a feed mechanism capable of meeting in high degree the aforesaid requirements, as well as others hereinafter appearing.

The invention contemplates also a feed roll loading means which, unlike the prior conventional loading devices utilizing springs, will afford in addition to the loading function a simple and immediate means for release of loading pressures and for separation of the feed rolls.

The invention may be more readily understood by reference to the attached drawings wherein:

Fig. 1 is a vertical sectional view showing the feed rolls and their relation to the printing cylinder;

Fig. 2 is a sectional elevation on the line 2—2, Fig. 1, and includes a diagrammatic showing of the hydraulic loading system for the feed rolls;

Fig. 3 is a fragmentary side elevational view showing details of the feed roll mechanism;

Fig. 4 is an elevational view similar to that of Fig. 3 but on a reduced scale and from the opposite side of the machine, printing cylinder shaft being shown in section;

Fig. 5 is a sectional view on the line 5—5, Fig. 3;

Fig. 6 is an enlarged sectional view on the line 6—6, Fig. 5, and

Fig. 7 is a fragmentary side elevational view similar to Fig. 4 but illustrating a modification within the scope of the invention.

In the drawings, the reference numeral 1 indicates a printing cylinder, and 2 a backing roll for said cylinder. The cylinder and roll are carried on shafts 3 and 4 respectively, which are suitably journalled in the side frames 5, 5 of the machine. The blanks of corrugated board or other stock, indicated by the reference numeral 6, are passed over a table 7 to a pair of feed rolls 8 and 9

which adjoin the cylinder 1 and roll 2. The roll 8 is carried on a shaft 11 journalled in the side frames 5, 5 and the axis of this roll is relatively fixed. The roll 9 is carried by a shaft 12 journalled in bearings 13 in a pair of arms or links 14 and 15 which are pivotally mounted on the side frames 5, 5 through the medium in the present instance of stub shafts 16 and 17 respectively. The pivoted links 14 and 15 provide for adjustment of the floating roll 9 to and from the roll 8.

Each of the links 14 and 15 has at its forward free end a pair of lugs 18 and 19 which provide bearings for the trunnions 21 and 22 of a member 23. The upper end of this member is split longitudinally as indicated at 24 and this upper end also has a threaded bore 25 which receives a screw 26. The screw has a knurled head 27 for adjustment of the screw 26 in the bore 25, and a screw 28 threaded into lugs 29 at opposite sides of the split 24 provides a means for clamping the screw 26 in adjusted position in the bore. At the top of the head 27 of the screw is a washer 31 which seats and is angularly adjustable in a concave socket 32 in the top of the head, the washer being secured in adjusted position by a screw 33. The function of this screw and of the washer 31 will be hereinafter described.

The lower end of the member 23 is provided with a threaded bore 34 which receives the correspondingly threaded end of the piston rod 35 of a hydraulic cylinder 36. The rod may be anchored against rotation in the bore 34 by a lock nut 37. The lower end of the cylinder 36 is pivotally anchored on a pin 38 in a bracket 39 secured to the proximate side frame 5 as shown in Figures 2 and 3. The cylinder 36 has ports 41 and 42 at top and bottom respectively through which hydraulic pressure fluid may be applied to and exhausted from the cylinder as hereinafter more specifically described. The cylinder and the associated elements described above are identical for each of the links 14 and 15 and the corresponding parts of the assemblies are indicated in the drawings by the same reference numerals.

Driving torque is transmitted to the feed rolls 8 and 9 in a manner calculated to avoid torsional deflection of the rolls. To this end the roll shafts 11 and 12 are provided with spur gears at each end indicated respectively by the reference numerals 43, 44, 45 and 46. The gears 43 and 45 are interconneced by a pair of idlers 47 and 48, the idler 47 being mounted on a stub shaft 49 supported in the adjoining side frame 5; and the gear 43 being journaled on the pin 17, see Fig. 5, which forms the pivotal support for the link 15. The gears 44 and 46 at the opposite ends of the roll shafts are similarly interconnected by idlers 51 and 52, the idler 51 being journaled on a stub shaft 50 in the side frame 5, and the gear 52 being journaled on the pivot pin 16 for the link 14. In the present instance the rolls are driven from a gear 53 on the cylinder shaft 3 which meshes with the idler 47, see Fig. 4; and as also indicated in this figure, the idler 48 is engaged with a gear 54 on the shaft 4 of roll 2.

The gear 46 is secured to the shaft 12 through the medium of a collar 55 keyed to the shaft and secured to the gear by a screw 56 threaded into the gear and passing through an arcuate slot 57 in the collar. This connection affords angular adjustment of the gear 46 about the shaft axis and with respect to the shaft. As shown in Fig. 3, the screw 56 is anchored in adjusted position in the slot 57 by set screws 58 and 59 on the collar which may be tightened against the opposite sides of the screw 56. The aforedescribed arrangement provides in effect a driving connetcion from both ends of the upper feed roll 8 to the corresponding ends of the lower feed roll 9 thereby eliminating torsional deflection in the rolls. Obviously

the driving connection is maintained regardless of relative displacement of the feed rolls.

As previously indicated, the lower feed roll **9** is operatively connected through the links **14** and **15** and members **23** with hydraulic cylinders **36**. Hydraulic pressure applied to the lower ends of the cylinders through the ports **42** will elevate the roll, the elevation of the roll and its ultimate proximity to the upper feed roll **8** being determined by the set screws **26**, the washers **31** at the upper ends of these screws being engageable with the undersurfaces **61** of overhanging portions of the respective side frames **5**, see Figs. 2, 3 and 4. Work blanks **6** passing between the rolls **8** and **9** will be subjected to the pressure exerted by the cylinders **36**, and in accordance with the invention this pressure can be precisely adjusted as to amount so as not to subject the material of the blank to crushing pressure while still giving sufficient pressure to insure positive feed of the blank. Should the feed of the blanks to the rolls be momentarily interrupted, the screws **26** will retain the rolls sufficiently far apart to afford easy access at the nip for the leading edges of the succeeding blank.

A hydraulic system whereby the feed roll **9** may be thus hydraulically loaded is illustrated in Fig. 2. Each of the cylinders **36** is connected to a separate constant delivery pump, **62** and **63** respectively, which are driven by a common electric motor **64**. Each pump delivers pressure fluid drawn from sump **65** to the port **42** of its associated cylinder by way of pipes **66**, **67**. In each case the connection between pipes **66** and **67** is controlled by a solenoid actuated valve **68**. When the valves are energized they connect the pipes **66** and **67**, as shown in Fig. 2; and when the solenoids are deenergized the valves move downwardly to disconnect the pipe **67** from pressure pipe **66** and to connect the pipe **67** and therefore port **42** of associated cylinder **36** with the sump by way of pipes **69** and **71**. This latter pipe also extends to port **41** of the cylinder which in this instance is permanently connected to sump. In each case the pipe **67** is connected to an accumulator **73** and pressure gage **74**. The hydraulic system for each pump is completed by a pressure relief valve **75** between pressure pipe **66** and sump pipe **1** which may be set individually to afford a desired operating pressure in its particular system as indicated on the gage.

The electric control circuit for the valves **68** is also shown in Fig. 2. It comprises a main control or motor switch **70**, manual loading and unloading switches **72** and **76** respectively, and relay **77**. The switch **76** is normally closed as shown in the drawings so that coil **79** of the relay is energized and current flows from source **78** to solenoids of valves **68** to hold the valves in position to deliver pressure fluid to ports **42** of cylinders **36** and thereby to hold roll **9** in elevated or operative position with respect to roll **8**.

The roll can be unloaded by opening switch **76** thereby deenergizing coil **79**, and opening relay **77**. This deenergizes solenoids of valves **68** which then move as described to connect ports **42** of cylinders **36** to sump. The roll may be reloaded by closing switch **72** to energize coil **79** and close relay **77**, again actuating valves **68** to deliver hydraulic fluid to ports **42** of cylinder **36**. Circuit through switch **76** holds circuit of coil **79** after reopening of switch **72**.

It is evident that there may be modification of the aforedescribed devices without departure from the invention. In the modification of Fig. 7, for example, the lower feed roll **81** is relatively fixed and the upper roll **82** is hydraulically loaded in accordance with the principle described above. In this case springs **83** attached to the arms or links **84** which support the upper roll tend to hold the roll in elevated, inoperative position and the cylinders **85** act by admission of hydraulic medium to the lower ports **86** to elevate the outer ends of the links and to depress the roll **82** against the spring pressure and to load the roll as described. In all other essential respects the assembly of Fig. 7 is the same as that shown in the other figures.

I claim:

1. In a machine for performing operations such as printing on blanks of corrugated board or like work stock susceptible to crushing under pressure, the combination with cyclically movable devices for performing said operations, of means for feeding the blanks thereto successively in uniform predetermined position and in precisely timed relation with the cyclical movements of said devices, said feeding means comprising a relatively fixed roll and mechanism for rotating said roll in timed relation to the movement of said devices, a floating roll forming with said relatively fixed roll a complementary pair engageable respectively with the opposite faces of said blanks, means for operatively connecting the rolls at both ends for positive synchronized rotation, a fluid pressure motor means connected to each end of the floating roll for urging the roll toward complementary roll and against the blanks, engaged with the latter roll, and a fluid pressure system for supplying pressure fluid to said motor means and including devices for accurately adjusting pressures of the fluid so supplied.

2. A machine according to claim 1 including adjustable means at each end of the floating roll for limiting the advance movement of the floating roll toward the relatively fixed roll.

3. A machine according to claim 1 wherein the means for operatively connecting the rolls comprises at each end a gear on each of the rolls, a pair of relatively fixed idler rolls meshing respectively with the first named gears and with each other, and a link providing a support for the floating roll and angularly movable about the axis of the idler gear immediately connected with said roll.

4. A machine according to claim 3 wherein the fluid motor means are connected respectively to said links.

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