Dec. 28, 1965 C. THUMIM 3,225,662

SUBMERGED SERVOMOTOR WITH PREFILL VALVE FOR GUILLOTINE TYPE PAPER CUTTING MACHINE

Filed Aug. 26, 1960 3 Sheets-Sheet 1

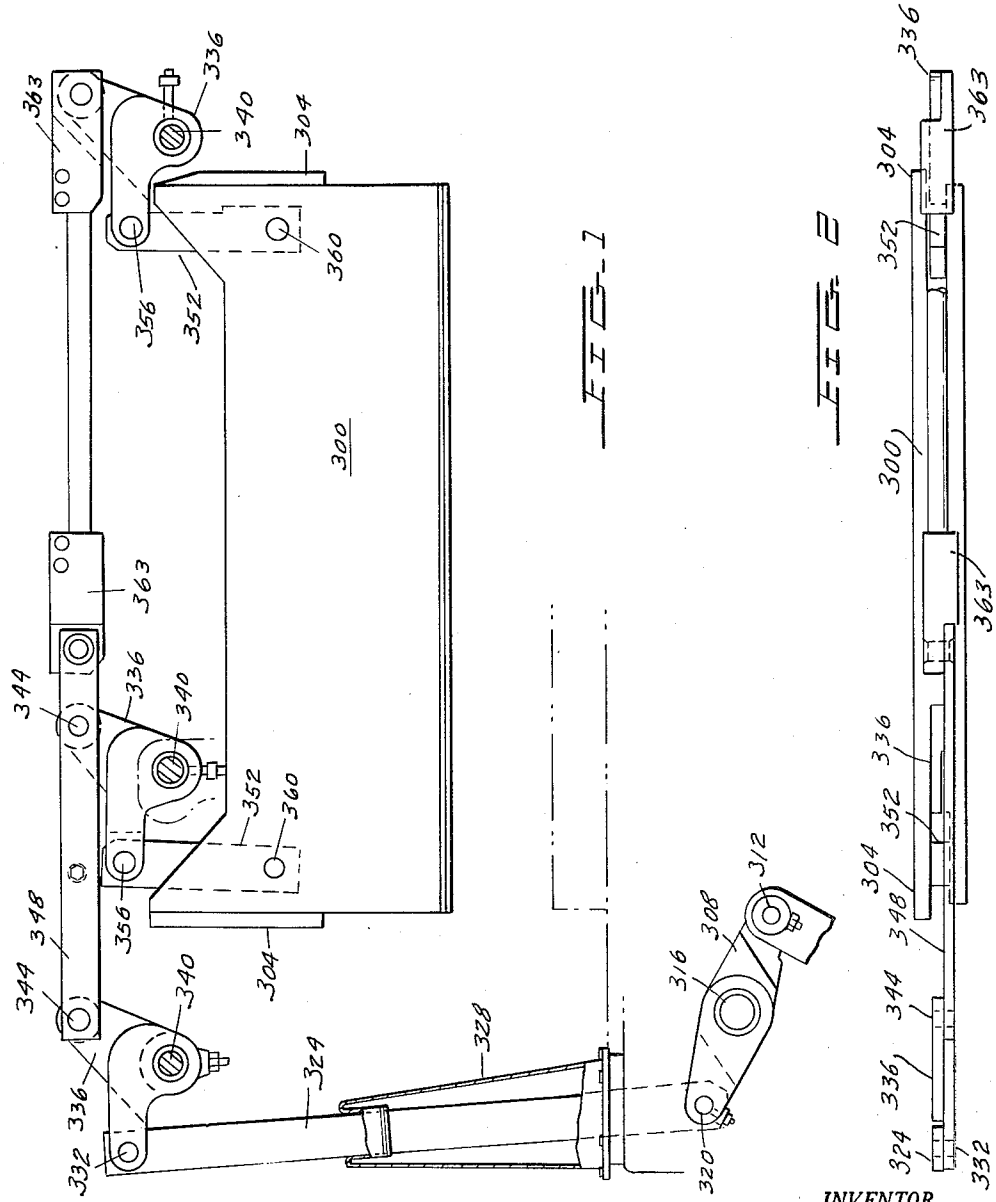

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FIG. 3

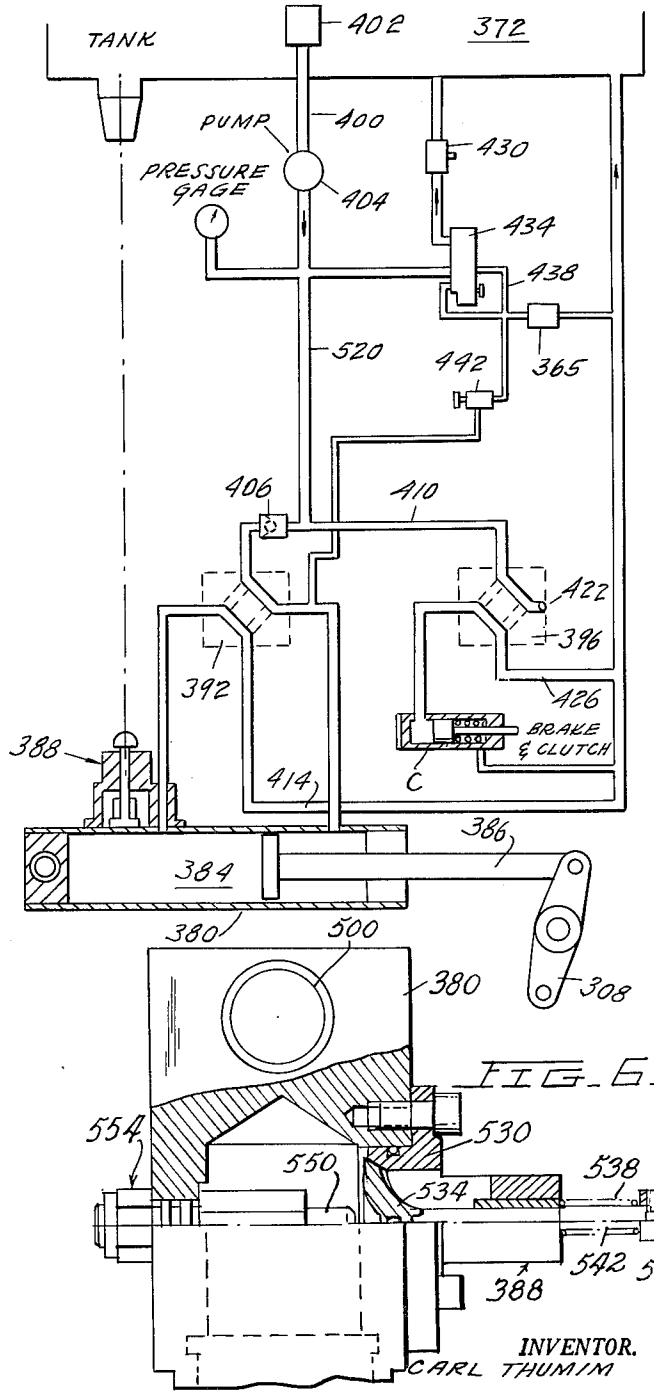

FIG. 6

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FIG. 5.

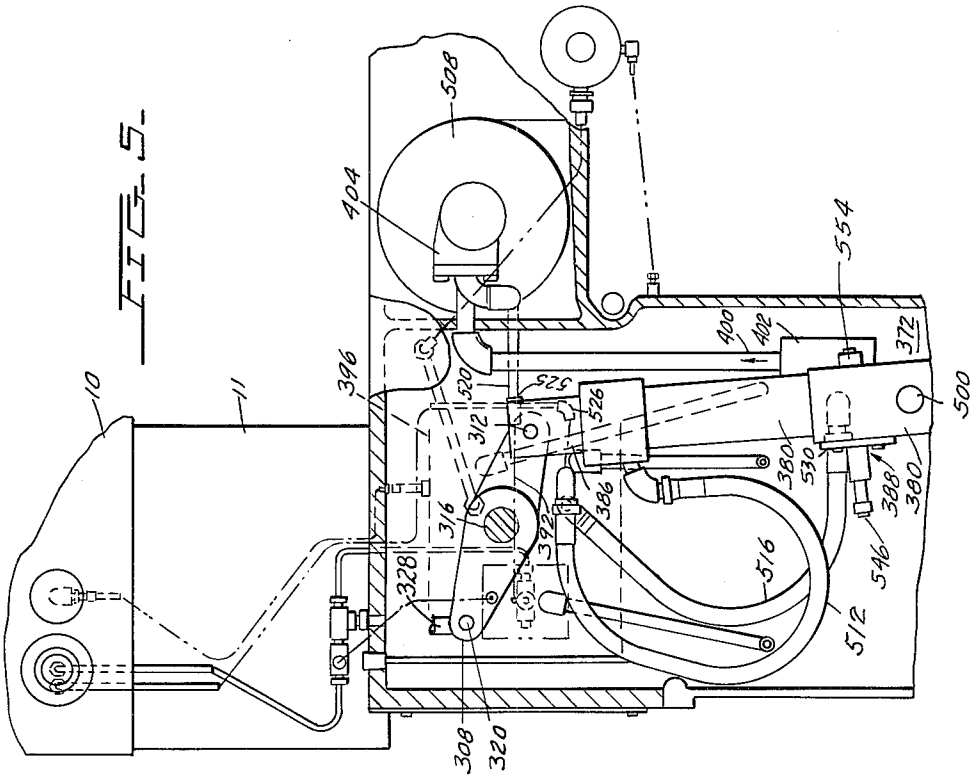
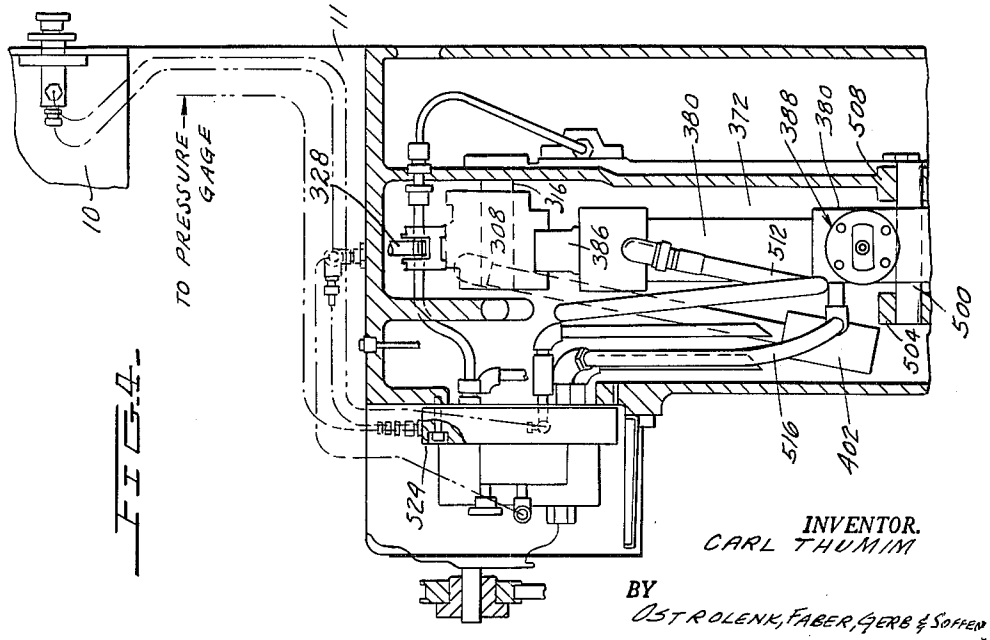


FIG. 4.



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3,225,662

SUBMERGED SERVOMOTOR WITH PREFILL VALVE FOR GUILLOTINE TYPE PAPER CUTTING MACHINE

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1 Claim. (Cl. 91—210)

This invention relates to paper cutting machines and more particularly to the type wherein a reciprocal knife blade is used.

It is an object of the invention to provide a compact machine construction, of economic manufacture, primarily intended for small or medium sized guillotine paper cutters.

Other objects and features of my invention will be apparent in the detailed description to follow.

Briefly, my invention comprises an entire guillotine paper cutting machine, herein disclosed in such essential details as would render it understandable to persons skilled in the art, certain details being omitted for clarity and for the reason that conventional construction may be used to supply the details. The entire machine comprises a combination having a cutting table with the usual cutting stick, etc., and a frame extending upwardly of the table, which frame supports a clamp bar and knife bar. For certain reasons to be hereinafter disclosed, the clamp bar is hydraulically actuated, while the knife bar is mechanically actuated. The hydraulic system utilizes a prefill valve arrangement for rapid downward traverse of the clamp prior to engaging a paper pile. Such hydraulic system utilizes a safety valve connected to the main hydraulic circuit which contains a remotely controlled vent valve actuated in response to clamp location to supply full hydraulic pressure when the clamp is rising and to reduce pressure to just enough to hold the clamp in raised position. Upon downward movement of the clamp, the remote control valve also becomes effective to supply pressure to the clamp. An additional control valve is utilized to vary the pressure on the clamp when it presses on the paper pile. The first valve is controlled by movement of the clamp, through a mechanical linkage, and the second manually by the operator.

A detailed description of the invention will now be given in conjunction with the appended drawing, in which:

FIGURE 1 is an elevation showing the clamp actuating linkage.

FIGURE 2 is a plan view of the clamp actuating linkage.

FIGURE 3 is a schematic diagram of the hydraulic system.

FIGURES 4 and 5 are, respectively, side and front views of the physical arrangement of the hydraulic system and the power cylinder for operating the clamp.

FIGURE 6 is a longitudinal view partially in section of a novel prefill valve for the power cylinder.

FIGURE 1 shows the clamp bar 300 and the essential actuating components. The clamp bar has side elements 304 which will be understood to ride in suitable guides (not shown) in the machine frame. The bar is actuated by means of a lever 308 having a bearing pin 312 at one end which will be understood to be moved by connection to a hydraulic cylinder, to be hereinafter disclosed. Lever 308 rocks around a fixed pin 316 suitably fastened to the machine frame. The other end of lever 308 is secured by a pin 320 to a pull bar 324 around which a suitable flexible boot 328 is disposed. Pull bar 324 at its upper end is pinned at 332 to a bell crank 336 suitably pinned for rocking motion around fixed pin 340, which

will be understood to be carried by the machine frame. The bell crank 336 is pivotally attached as by a pin 344 to a horizontal rod 348 for effecting endwise force thereon and to which rod are pivoted two other bell cranks actuatable by rod movement and designated by the same reference character 336, inasmuch as they are identical with the first-mentioned bell crank 336. The latter bell cranks effect movement of the clamp bar and are suitably pinned to the machine frame as by fixed pins 340, corresponding to the identical pin 340 of the first-mentioned bell crank 336. The latter bell cranks 336 are each attached by a link 352 through pins 356 to the clamp bar 300 as by pins 360. From the foregoing construction, it will be apparent that when lever 308 is rocked counterclockwise a pull is exerted on pull bar 324 to rock all the bell crank levers and thus translate clamp bar 300 downwardly with an even and uniform pressure.

As shown on the drawing, the horizontal bar 348 may consist of several bars attached to a center block or yoke 363.

A brief description of the hydraulic circuit which actuates the clamp, as shown on schematic layout FIGURE 3, is in order. Thus, referring to FIGURE 3, an open tank 372 for fluid storage is provided having a double-ended hydraulic cylinder 380 having a piston 384 which, operating through a piston rod 386, actuates the lever 308 (see FIGURE 1). For clarity, in FIGURE 3, the cylinder is not shown as disposed in the tank, but such construction will be hereinafter described in connection with FIGURES 4 and 5.

A prefill check valve 388 (disposed in the tank) is provided together with a four-way valve 392 for controlling operation of upward and downward movement of the clamp. Another multi-way control valve 396 controls the brake and clutch which in turn controls movement of the knife bar, all as hereinbefore described. Both of these multi-way valves are controlled by solenoids which in turn are under operator control. Thus, valve 392 controls pressure from a line 400 connected to tank 372 through a filter 402, there being a pump 404 in the line for directing pressure to valve 392 through a suitable check valve 406 via a line 410. Line 410 also connects hydraulic pressure from the pump to the knife control valve 396 as indicated. An exhaust line 414 is provided connected to both of the multi-way valves and running back to the tank. It will be noted that a single acting pressure cylinder C (FIGURE 3) having a spring biased piston is connected to valve 396; the piston serves to control a brake-clutch mechanism of the machine.

It will likewise be noted that valve 396 has one channel plug at 422, only three connections being made to the valve. Thus, in the shown position of the valve, fluid can flow through the line 426 for exhausting the cylinder C whence spring pressure, as hereinbefore described, effects automatic braking by moving the piston to the left. In another position of valve 396, pressure goes to cylinder C for movement of the piston to the right to overcome the brake-engaging bias of the spring and effect engagement of the clutch.

A back pressure needle valve 430 to maintain the clamp in upward position together with a relief valve 434 and a leak tube of fine diameter 438 are utilized in the present arrangement. Likewise, a clamp pressure remote control adjustable valve 442 is incorporated in the present system. Further, valve 392, can supply pressure to either end of the cylinder while exhausting the other end and otherwise functions in the manner described in my copending application.

FIGURES 4 and 5 show side and front views partially in section of the overall arrangement of the hydraulic circuit and mechanism and cylinder mechanism of the machine. Thus, the clamp actuating cylinder 380 is shown

carried inside the open top tank 372. It will, of course, be appreciated that the bottom of the tank, shown broken in the drawing, is actually closed. The lower end of cylinder 380 is rockably carried on a pivot pin 500 having suitable bearing supports 504 and 508. Thus, 504 may be a web provided in the tank, while bearing support 508 may be provided by thickening a portion of the wall of the tank, as shown. Piston rod 386 rises out of the cylinder 380 and is connected to the lever 308 (FIGURE 1) as indicated in FIGURE 16. Within the tank 372 is the filter 402 and rising upwardly therefrom, the line 400 going to the pump 404 which is directly carried on the motor shaft of motor 508. The clamp valve 392 as well as the knife valve 396 are shown in their relative positions as by dotted lines.

The various piping connections are disclosed in FIGURES 4 and 5, it being noted that flexible tubing 512 and 516 are utilized for connections to the cylinder, inasmuch as the cylinder is mounted for a rocking movement of lover 308 on fixed pin 316, connected at 312 to piston rod 386 to effect actuation of pull bar 324, as hereinbefore described (FIGURE 1). It will also be noted that vent valve 365 is mounted so that the overflow from the top of the valve can drip back into the tank. The compact assembly of the hydraulic units is entirely enclosed within the machine housing and cabinet structure.

Oil from the pump discharges through line 520 into a solid sub-base 524 through fittings 525, 526.

As hereinabove described, the prefill valve 388 is opened by suction developed in the cylinder 380 by weight of the clamp as the clamp falls, the valve opening until it hits a stop. Thus, referring to FIGURE 6, the prefill valve 388 is built into the lower end of the cylinder 380 by providing a bushing 530 suitably bolted into a bore in the side of the cylinder as shown. Bushing 530 shows a valve seat for a valve head 534 spring biased to closed position by a spring 538 which encompasses the valve rod 542 and abuts at the outer end of the rod against a collar 546. Inward motion of the valve head, that is, to permit oil to flow into the cylinder, is limited by a stop pin 550 carried axially of the valve by the opposite wall of the cylinder with suitable threaded bolt and nut adjusting means generally designated as 554, so that the amount of motion of the valve head can be controlled by the position of abutment pin 550.

It will be noted that, due to the position of the prefill valve 388, at the bottom of the cylinder, which is at the bottom region of the oil filled tank, no connections between the prefill valve and the cylinder are necessary or between the prefill valve and the oil supply, since it is constantly exposed, obviously, to oil within the tank.

Thus, as the clamp drops of its own weight, it moves the piston within the cylinder away from the prefill valve effecting a suction which opens the valve. However,

should the clamp slow down or stop, the suction ceases and the valve is thus closed by virtue of the biasing of its spring 538.

I claim:

In a hydraulic system for the clamp of a cutting machine, tank for fluid, a hydraulic power cylinder disposed within said tank, means rockably mounting an end of said cylinder within said tank, said cylinder having a piston rod extending therefrom and movable therein and means for connecting said rod to a clamp for actuation thereof, and flexible tubing connected to said cylinder for effecting flow of pressure fluid with respect thereto, a prefill valve carried by said cylinder and disposed for submergence within said tank whereby fluid in said tank has access to said cylinder through said valve, said cylinder having a lower end in said tank and said prefill valve being secured thereto at said lower end and being openable by suction within said cylinder.

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