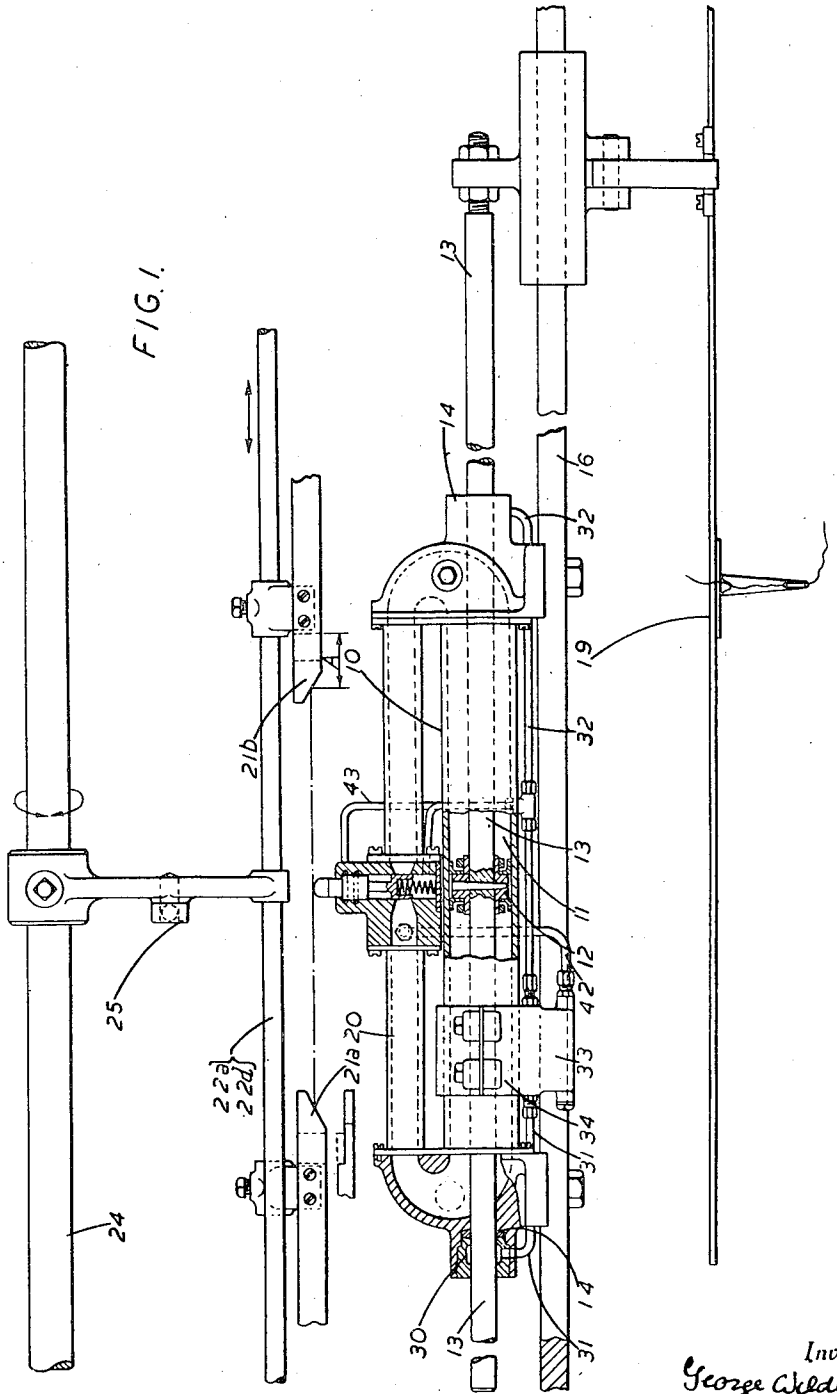
Aug. 10, 1948. G. WILDERS ET AL 2,446,862

KNITTING MACHINE

Filed June 28, 1945 3 Sheets-Sheet 1

FIG. 1.



Inventor
George Wilders
By John Edward Lynam
Attorney

Aug. 10, 1948. G. WILDERS ET AL 2,446,862

KNITTING MACHINE

Filed June 28, 1945 3 Sheets-Sheet 2

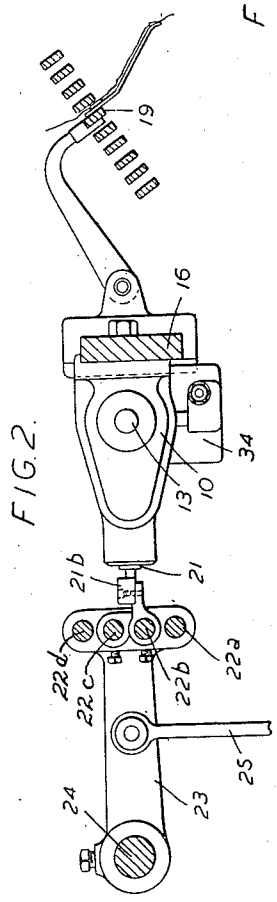


FIG. 2.

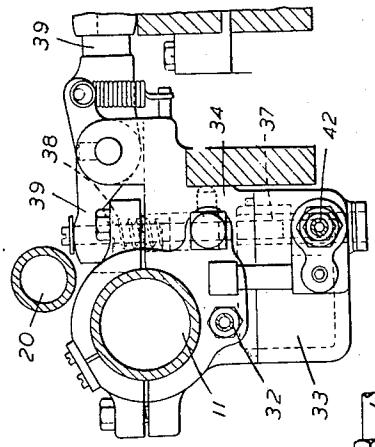


FIG. 4

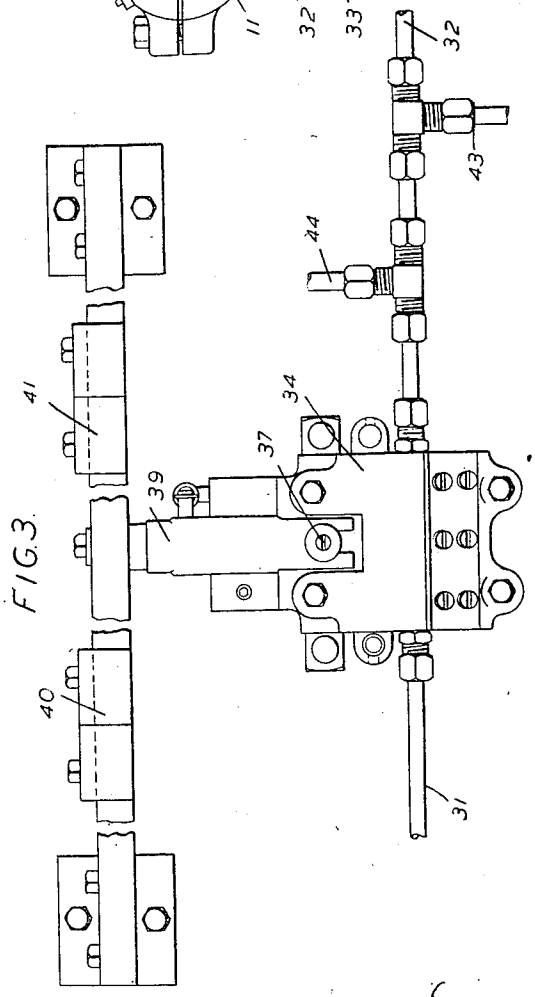


FIG. 3.

Inventor
George Wilders
John Edward Lyman
By Judaels & Judaels
His Attorney

Aug. 10, 1948. G. WILDERS ET AL 2,446,862

KNITTING MACHINE

Filed June 28, 1945 3 Sheets-Sheet 3

FIG.5.

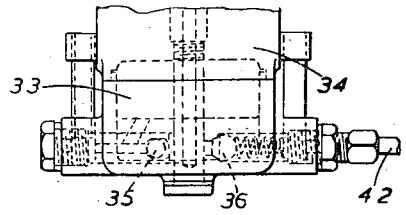


FIG.6.

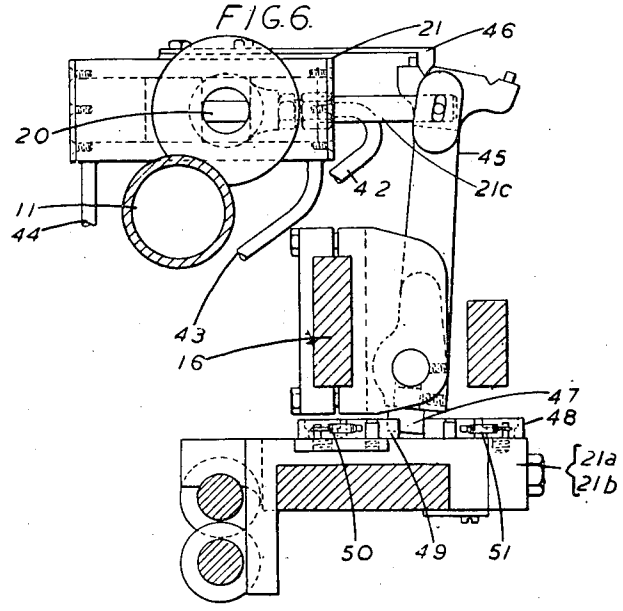
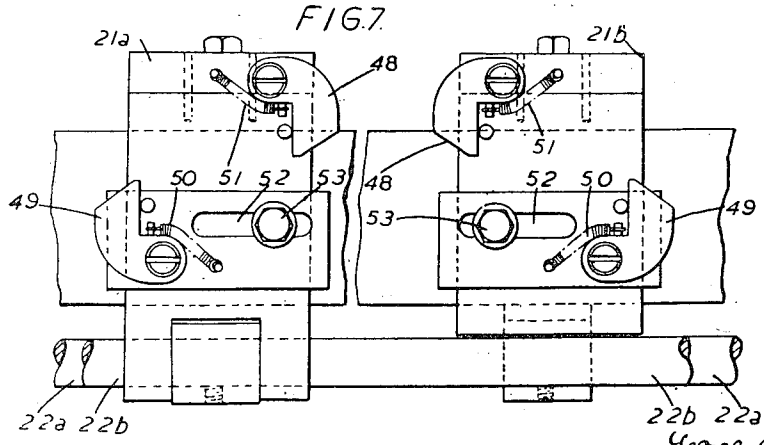


FIG.7.



Inventor
George Wilders
By John Edward Lymans
Mudall & Co
his Attorney

Patented Aug. 10, 1948 2,446,862

UNITED STATES PATENT OFFICE

2,446,862

KNITTING MACHINE

George Wilders, Kegworth, and John Edward Lynam, Mapperley, Nottingham, England, assignors to William Cotton Limited, Loughborough, Leicestershire, England

Application June 28, 1945, Serial No. 602,069
In Great Britain June 28, 1944

5 Claims. (Cl. 66—126)

1

This invention concerns knitting machines incorporating hydraulic mechanism, and is primarily applicable to machines (especially Cotton's patent and other straight bar knitting machines) of the type having a member movable to and fro along a line of needles. The said member may be a carrier or carrier rod, a slur cock, tie bar or the like.

In the application of hydraulic mechanism to knitting machines (e. g. for driving the aforesaid member) it is important that oil leakage should be reduced to a minimum because of its deleterious effect upon the proper functioning of the machine and upon the product. Therefore the present invention provides a knitting machine having a hydraulic mechanism and means for collecting such hydraulic fluid as may leak therefrom and for returning it to the hydraulic circuit. More specifically, where the mechanism comprises a member protruding through a gland or bearing (as for example in the case of a piston rod or valve spindle), there is provided a collector outside the gland or bearing (i. e. at that side thereof towards which leakage may occur) and a connection leading from said collector to return the collected fluid to the system. Preferably a pump is provided for forcing the collected fluid back into the system.

The foregoing, and other features of the invention set out in the appended claims, are incorporated in the example now to be described with reference to the accompanying drawings in which—

Figure 1 is a diagram illustrating the application of the invention to the mechanism forming the subject matter of British patent specification Nos. 565,240 and 565,268;

Figure 2 is an end elevation of an hydraulic piston-and-cylinder device and pump;

Figure 3 is a plan,

Figure 4 a part-sectional view of the pump on a larger scale, while

Figure 5 shows the sump of the pump and certain non-return valves therein;

Figure 6 is a sectional elevation of modified valve-operating mechanism, and

Figure 7 is a plan of certain details thereof.

As disclosed by the aforesaid specifications, in a Cotton's patent or other straight bar knitting machine there is a hydraulic coupling comprising a piston-and-cylinder device 10 of which the cylinder 11 is reciprocated with constant amplitude by the Coulier mechanism (with the slur cock or cocks) through the medium of bar 16 and the piston 12 has its rod 13 connected to a selected

2

carrier rod 19, a by-pass conduit 20 being provided between opposite ends of the cylinder 11 which by-pass is controlled by a valve 21 operated by cams 21*a*, 21*b*, adjustable with the carrier stops through rods such as 22*a*, 22*b*, to vary the piston travel.

The valve 21 (shown as a plunger valve) controls the by-pass conduit 20 so that the latter may be opened to permit oil or other hydraulic fluid to flow from one end of the cylinder 11 to the other, in which case the piston 12 is free to move along the cylinder, or may be closed to prevent the oil flow, in which case relative movement between the cylinder 11 and piston 12 is prevented. The arrangement is such that at or slightly before the time when the carrier rod 19 strikes its end stop the valve 21 is opened. Thereafter while the piston 12 is held stationary by the end stop the cylinder 11 continues to move under the influence of the draw mechanism so that oil is transferred from one end of the cylinder to the other, it being appreciated that the length of the cylinder must be such that the maximum relative travel between the cylinder and piston is at least equal to the length of the idle part of the draw, that is to say that part of the draw which occurs while the selected carrier is held stationary. Upon movement of the draw mechanism in reverse direction the valve is closed so that the piston and cylinder are locked together and the piston and the carrier to which it is connected is compelled to travel with the cylinder. The same sequence of operations takes place at the other end of the draw.

In order that the valve may be opened and closed at the appropriate times the following valve operating mechanism is adopted. Two cams 21*a*, 21*b* are provided carried respectively by two rods, of a group thereof 22*a*–22*d* supported on levers 23 from shaft 24 and capable of being raised and lowered by connections indicated at 25 from a truck lever moved by a cam on the main cam shaft. These rods are intended to be shifted by stop mechanism such for example as the selvedge stops or splicing stops to vary the spacing between the cams carried thereby. Obviously, then, the point in the traverse of bar 16 at which the valve plunger strikes either cam (thereby to open the valve) can be varied and the travel of the carrier varied as a result. Each cam is of the stepped configuration shown in elevation in the small sketch beneath the left hand cam 21*a* in Fig. 1. At the end of the draw, the cams are lowered so that as the cylinder 11 moves in the reverse direction with bar 16 the valve plunger

travels along the straight part of the cam but instead of riding down the incline, falls off the step so that the valve closes suddenly and the carrier picks up. The distance marked "A" in Fig. 1 is a measure of the difference between the two points in the travel of bar 16 whereat the valve opens and closes, and this difference in timing gives the necessary lead of the carrier. This lead may be varied (e. g. shortened for plating) by a suitable shaping of the cam as indicated by the shaded portion, and the inclined portion is so located that the valve opens just as the carrier reaches its stop. It will be appreciated that if a gradual pick up of the carrier is required, instead of an abrupt step there may be an incline permitting the valve to close gradually.

According to the present invention, at each end of the cylinder 11 the piston rod 13 protrudes through a gland 14. Outside each gland, an annular recess 30 is formed around the rod 13 in the end member of the cylinder. Therefore oil leaking through either gland collects in the annulus 30; this collected oil is led by return pipes 31, 32 to a *s* sump 33 at the base of a pump 34 mounted on the cylinder 11. The pump 34 draws from the sump 33 through a non-return valve 35 and delivers through another (36) and pipe 42 to the by-pass 20, and delivery is timed to take place when the by-pass is open at one or each end of the draw.

Preferably the pump is driven through a device that yields at a predetermined pressure. In a convenient arrangement (Figs. 3 and 4), the pump is a plunger pump and the plunger 37 is depressed through a compression spring 38, pressure being applied by a lever 39 rocked by two stationary cams 40, 41 as the pump traverses to and fro with the cylinder.

Leakage may also take place from the valve 21 controlling the by-pass 20. Therefore a collector annulus is provided at the outer side of the gland through which the spindle of the valve protrudes towards the valve-operating means, and another collector is provided at the other end of the valve spindle. From these collectors pipes 43, 44 lead to one of the return pipes.

In the modified valve-operating mechanism illustrated in Figs. 6 and 7 the spindle 21*c* of valve 21 is connected to a rocking lever 45 having a spring-loaded catch 46 for preventing it from moving accidentally from the "open" or "shut" position after it has been moved thereto. The said valve spindle 21*c* and lever 45 travels to and fro with the cylinder 11 and the lever has a truck 47 that towards each end of the cylinder stroke strikes a stationary operating device (indicated generally by the references 21*a*, 21*b*) that moves the valve. The spacing between these devices is adjustable with the carrier stops to ensure that the travel of the piston 12 coincides with the permitted travel of the carrier.

Each device consists of two ramps 48, 49 slightly spaced apart in the direction of piston travel and therefore, for convenience, referred to as the inner and outer ramps. As the cylinder moves towards an end of its travel, the truck 47 engages the inner ramp 48 which swings the valve lever 45 and moves the valve 21 from the closed to the open position so that the piston ceases to be coupled to the cylinder and the carrier comes to rest. Continued movement of the cylinder brings the truck into contact with the outer ramp 49 which swings out of the way (against the action of spring 50) so that the truck carries on past it. During the return stroke of the cylinder,

the truck 47 again strikes the outer ramp 49 which, being opposite the inner ramp 47, moves the valve 21 to the closed position so that the piston and carrier commence to move. It is to be noted that they do so at a point nearer the end of the draw (or slur cock travel) than that at which they cease to move; that is the carrier "lead" and its extent depends upon the spacing between the inner and outer ramps. Continued movement of the cylinder brings the truck 47 against the inner ramp 48, which moves out of the way against the action of spring 51, and the truck carries on past it, until at the other end of the cylinder travel the truck is acted on by the other operating device in the manner just described.

It may be desirable to vary or adjust the lead, and therefore any suitable means (such for example as the slot 52 and bolt 53) is provided whereby the spacing between the two ramps 48, 49 of an operating device may be adjusted. Furthermore, it may be desirable to alter the lead in accordance with the machine speed, and for this purpose there may be a connection between each device and the speed regulating or speed control apparatus of the machine for adjusting the spacing in conformity with the machine speed. For example, the connection may extend to member such as the speed-controlling quadrant 12 of patent specification No. 548,713.

We claim:

1. In a knitting machine having a hydraulic piston-and-cylinder device for driving a member, such as a carrier, to and fro, said device including a piston rod protruding from an end of the cylinder; means for preventing leakage of hydraulic fluid along said protruding rod comprising a collector for leaking fluid and a pump and connections for returning said fluid to the hydraulic system.

2. In a knitting machine having a hydraulic piston-and-cylinder device for driving a member to and fro, which device includes a piston rod protruding from an end of the cylinder, a by-pass conduit connecting opposite ends of the cylinder, and valve-means for opening and closing said conduit; a leakage collector at said end of the cylinder, and a pump and connections for returning collected fluid to the by-pass conduit.

3. In a knitting machine having a driver movable to and fro, a hydraulic coupling for driving a member to and fro from it, which coupling includes a member protruding from the hydraulic system whereby there is a liability to leakage of hydraulic fluid at the protrusion, and valve means for rendering the driving coupling operative and inoperative, and having two spaced valve-operating devices between which and said valve means relative to-and-fro movement takes place, as the driver moves to and fro, to bring them into operative association at each end of a traverse; leakage-collecting means, for collecting any leaking fluid at the protrusion and for returning it to the hydraulic system, including a pump and means for operating it periodically in the to and fro movement; and in each valve-operating device two spaced operating members, an inner device for rendering the coupling inoperative towards the end of one traverse of the driver and an outer device for rendering the coupling operative upon the commencement of the reverse traverse of the driver.

4. In a knitting machine, the combination of hydraulic apparatus and means for collecting such hydraulic fluid as may leak therefrom and

for returning it to the hydraulic circuit, which means comprises in combination a pump, a non-return valve through which it draws leaking fluid, and a second non-return valve through which it forces said fluid back into the circuit.

5. In a knitting machine, the combination of hydraulic mechanism and means for collecting such hydraulic fluid as may leak therefrom and for returning it to the hydraulic circuit, which means comprises a sump for receiving the leakage, a pump for drawing therefrom and for delivery back to the circuit, a non-return valve between sump and pump and a non-return valve at the delivery side of the pump.

GEORGE WILDERS.
JOHN EDWARD LYNAM.

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