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3,462,056

STOCK FEEDER

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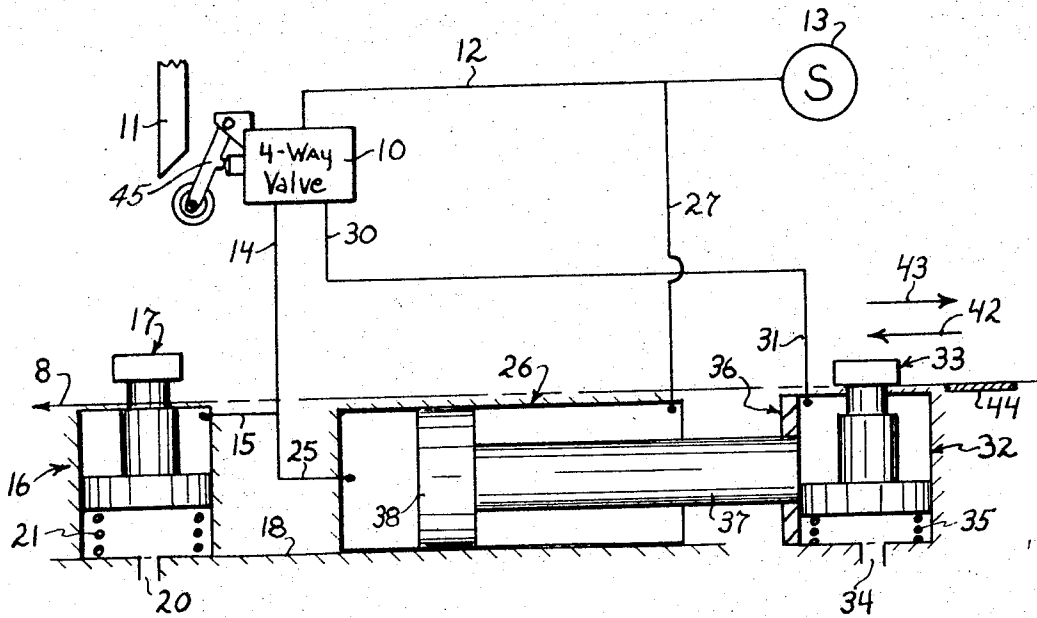


Fig. 1

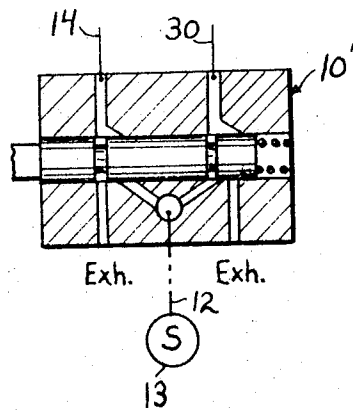


Fig. 2

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STOCK FEEDER

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2 Claims

ABSTRACT OF THE DISCLOSURE

A fluid operated stock feeding control and actuating device having a single four-way valve that controls a main double acting fluid motor that is adapted to reciprocate a feed slide in feeding and indexing directions, a first single acting fluid motor means that is adapted to actuate a stock clamp from a release position to a stock clamping position, and a second single acting fluid motor means for moving a stock gripper from a release position to a stock gripping position and for applying the operative stock gripping forces to the stock being fed; fluid pressure being supplied to the head end of the main fluid motor and to the first single acting fluid motor means during a non-feeding indexing stroke of the device, and being supplied to the rod end of the main fluid motor and to the second single acting fluid motor means during a stock feeding stroke of the device.

This invention relates to a novel arrangement and control means for a stock feeding device. More particularly the invention relates to an improved arrangement for, and a fluid circuit for controlling the operation of, a stock feed device that is adapted to intermittently advance an elongated workpiece into a work station.

In each of the fluid operated stock feeding devices illustrated in U.S. Patents 3,038,645, 3,329,327, 2,397,974 and 3,326,438 there is provided a main duplex feed cylinder arrangement that is continuously supplied with pressure fluid at one operative end thereof, with one or the other of the stationary stock clamping motor means and the movable stock gripping motor means thereof also being continuously supplied with pressure fluid so as to bias this clamping or gripping means towards either its stock engaging or its stock releasing position. This type of continuous fluid bias for the work clamping or gripping means has certain operational disadvantages, for example it can cause sluggishness in the displacing of the work clamping or gripping means in a direction against the action of said continuous bias thereon.

The primary object of the instant invention is to overcome the above mentioned disadvantages by providing an improved actuating and control means for a stock feeder wherein a fluid biased main cylinder cooperates with a stationary work clamping motor means and a reciprocating work gripping motor means each of the two last mentioned motor means being operated in a work engaging direction by the direct application of fluid pressure thereto respectively.

Another object of the invention is to provide an improved stock feeding device wherein the main feed cylinder is continuously biased in a feed direction and the stock gripping means and the stock clamping means are each spring biased to stock releasing position.

A further object of the invention is to provide an improved stock feeding device wherein one operative end of the main fluid motor cylinder is continuously supplied with fluid pressure and wherein a single four-way valve is arranged to control the application of fluid pressure to the other operative end of the main cylinder and to two associated single acting fluid operated stock clamping and gripping means of the feeding device.

Another object of the invention is to provide an improved stock feeding arrangement wherein a single four-way valve is operative in a first condition thereof to supply fluid pressure to the head end of a main double acting fluid motor and also to a single acting stock clamping fluid motor means during a non-feeding stroke of said arrangement, and is operative in a second condition thereof to exhaust fluid pressure from said single acting fluid motor means and said head end of said double acting fluid motor during a stock feeding stroke of said arrangement.

Other objects will become apparent as the disclosure progresses.

In the drawings:

FIGURE 1 illustrates the general feeder arrangement and shows the fluid circuit control therefor.

FIGURE 2 is a central sectional view illustrating one type of four-way valve that may be used in the control circuit of FIGURE 1, this valve being of a well known balanced two-position spring return type.

Referring to FIGURE 1 there is shown an overall structural environment which may generally correspond to that illustrated in said Patent 3,329,327. The path along which the stock is to be fed is indicated by an arrow 8. In the instant control arrangement a conventional type four-way valve 10 is adapted to be actuated by a cam member 11 that is secured for movement with a punch press ram of other element of the machine with which the instant feeder is associated. Valve 10 has an inlet that is connected by a line 12 to a source of air pressure 13 and has a first output line 14 that is connected by a line 15 to the upper cylinder portion of a single acting air motor 16 that is adapted to actuate a stock clamping device 17 from a stock releasing position to a stock clamping position; air motor 16 and device 17 being carried on the frame 18 of the instant feeder. The lower cylinder portion of motor 16 is vented as at 20 and the stock clamping device 17 is biased to an upper or stock releasing position by means of a suitable spring such as 21. The said valve output line 14 is also connected by a line 25 to the forward or head end of a main feed motor or cylinder 26, the rearward or rod end of this cylinder being directly connected to said pressure source 13 through a line 27 and said line 12. The other output line 30 of the four-way valve 10 is connected by a line 31 to the upper cylinder portion of the single acting air motor 32 that is adapted to actuate a stock gripping device 33 from a stock releasing position to a stock gripping position. The lower cylinder portion of air motor 32 is vented as at 34 and the stock gripping device 33 is biased to an upper or stock releasing position by a suitable spring such as 35. The air motor 32 and stock gripping device 33 are carried by a feed head or slide 36 which is secured to the outer end of a piston rod 37 that is attached to the piston 38 in the main cylinder 26. The feed slide 36 is mounted on suitable side rails for reciprocation between suitable abutment stops; said rails being secured to said feeder frame 18. As will be apparent the feed slide 36 is adapted to be reciprocally actuated by the said main cylinder 26 in feed and index directions 42 and 43 respectively.

In the normal condition of the four-way 10 the output line 30 communicates with the air pressure inlet line 12 while the output line 14 communicates with the valve exhaust. Under these conditions the spring 21 will move the stock clamping device 17 to a stock releasing position, the air motor 32 will move the stock gripping device 33 from a stock releasing position to a stock gripping position, and the fluid biased end of the main cylinder will move the feed slide 36 forwardly in said feed direction 42. Thus the normal condition of the feeder is such that the feed slide 36 is in its forward position while the stock

gripping device 33 is in a stock gripping position and stock clamping device 17 is in a stock releasing position.

When the machine part, such as a punch press ram, moves downwardly so that the cam 11 displaces the valve actuator arm 45 the four-way valve 10 will be shifted to its actuated condition wherein the output line 14 is connected to pressure and the output line 30 is connected to exhaust. Under these conditions air motor 16 will move the stock clamping device 17 from a stock releasing position to a stock clamping position, the spring 35 will move the stock gripping device 33 to a stock releasing position and the main cylinder 26 is now being supplied with air pressure through line 25 will move feed slide 36 rearwardly in an index direction 43 against said forward fluid biasing action so as to thereby produce a non-feeding or indexing stroke of the instant feeder, the stock 44 being held immovable during this stroke by the stock clamping device 17. When the machine part carrying the cam 11 moves upwardly so that said cam moves out of engagement with the valve arm 45 the four-way valve 10 will be shifted back to its normal condition (as by a spring means as illustrated in FIGURE 2) wherein the valve output line 14 is connected to exhaust and the valve output line 30 is connected to pressure. Under these conditions spring 21 will move the stock clamping device 17 from a stock clamping position to a stock releasing position, the air motor 32 will move the stock gripping device 33 from a stock releasing position to a stock gripping position, and the forward end of the main cylinder or motor 26 is now being connected to exhaust will by the action of the said continuous fluid pressure at the rearward end thereof allow the feed slide to move in a feed direction 42 so as to thereby produce a stock feeding stroke of the instant feeder. The parts are thus returned to their said normal conditions and a predetermined length of stock will be thus incrementally advanced into the work station. In the actuation and control arrangement for the instant feeder the fluid pressure continuously applied to the rearward end of the main cylinder assists in the proper time delay between the operation of the stock gripping and clamping devices 33 and 17 and the initiation of each indexing and feeding movement of the feed slide 36.

By utilizing a four-way valve in combination with two single acting work clamping and gripping fluid motors and a fluid biased main cylinder the need for said continuous fluid supply to one of the stock clamping or gripping devices is eliminated along with the inherent operational disadvantages thereof, the present control arrangement thereby significantly improving the operational efficiency of a stock feeder.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. Hence, the present embodiment is to be considered in all respects merely as being illustrative and not as being restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description.

What is claimed is:

1. A stock feeding device that is adapted to be operated through alternate indexing and stock feeding strokes comprising:

- a frame;
- a feed slide mounted on said frame for reciprocation in index and feed directions;
- a main double acting air motor means connected to

reciprocally actuate said feed slide, said air motor means including a cylinder, a piston therein and a piston rod connected between said piston and said feed slide;

- a stock clamping means mounted on said frame and adapted to be moved between stock releasing and stock clamping positions;
 - a stock clamping air motor means carried by said frame for actuating said stock clamping means from a stock releasing position to a stock gripping position;
 - a stock gripping means mounted on said feed slide and adapted to move between stock releasing and stock gripping positions;
 - a stock gripping air motor means carried by said feed slide for actuating said stock gripping means from a stock releasing position to a stock gripping position;
 - a single four-way valve having an input line that is adapted to be operatively connected to an air pressure source, an exhaust connection, and two output lines;
 - a first air line connecting the first valve output line to one operative end of said main double acting air motor means and to said stock clamping air motor means;
 - a second air line connecting the second valve output line to said stock gripping air motor means;
 - a third air line adapted to connect the other operative end of said main double acting air motor means directly to an air pressure source so that said feed slide is continuously biased in one of said directions;
 - said valve means being operable in a first condition thereof to supply air pressure through said first line to said stock clamping air motor means to said one end of said main double acting air motor means, and to exhaust air pressure through said second air line from said stock gripping air motor means whereby said feed slide partakes of an indexing stroke while said stock clamping means holds the stock stationary;
 - said valve means being operable in a second condition thereof to exhaust air pressure through said first line from said stock clamping air motor means and from said one end of said main double acting air motor means, and to supply air pressure through said second air line to said stock gripping air motor means whereby said feed slide partakes of a feed stroke while said stock clamping means remains in a release condition.
2. Apparatus as defined by claim 1 wherein said third air line serves to continuously bias said feed slide in a stock feed direction, and wherein said stock clamping and stock gripping air motor means each comprise a single acting air motor means.

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