

March 1, 1932.

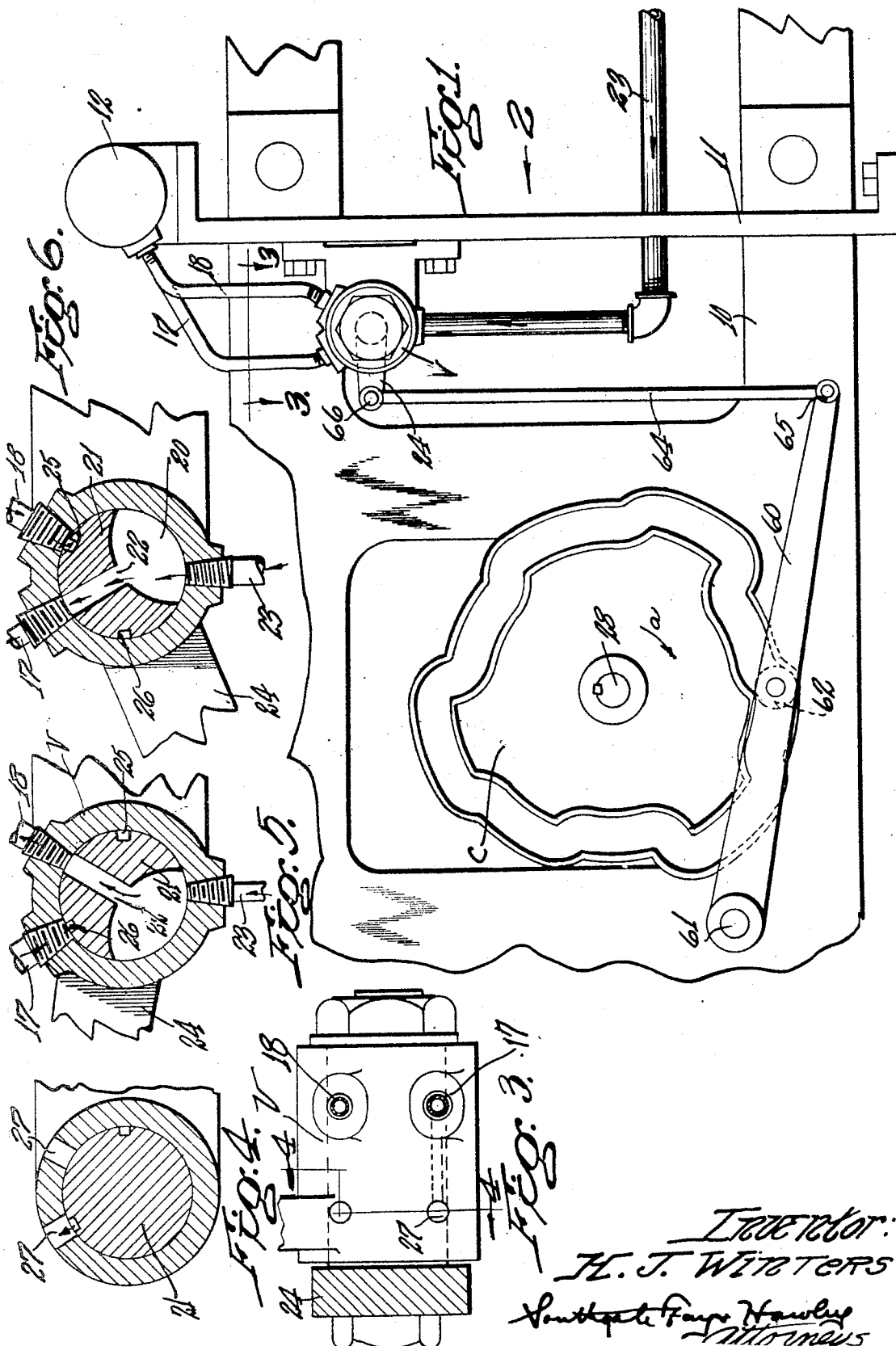
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Filed June 3, 1931

2 Sheets-Sheet 1



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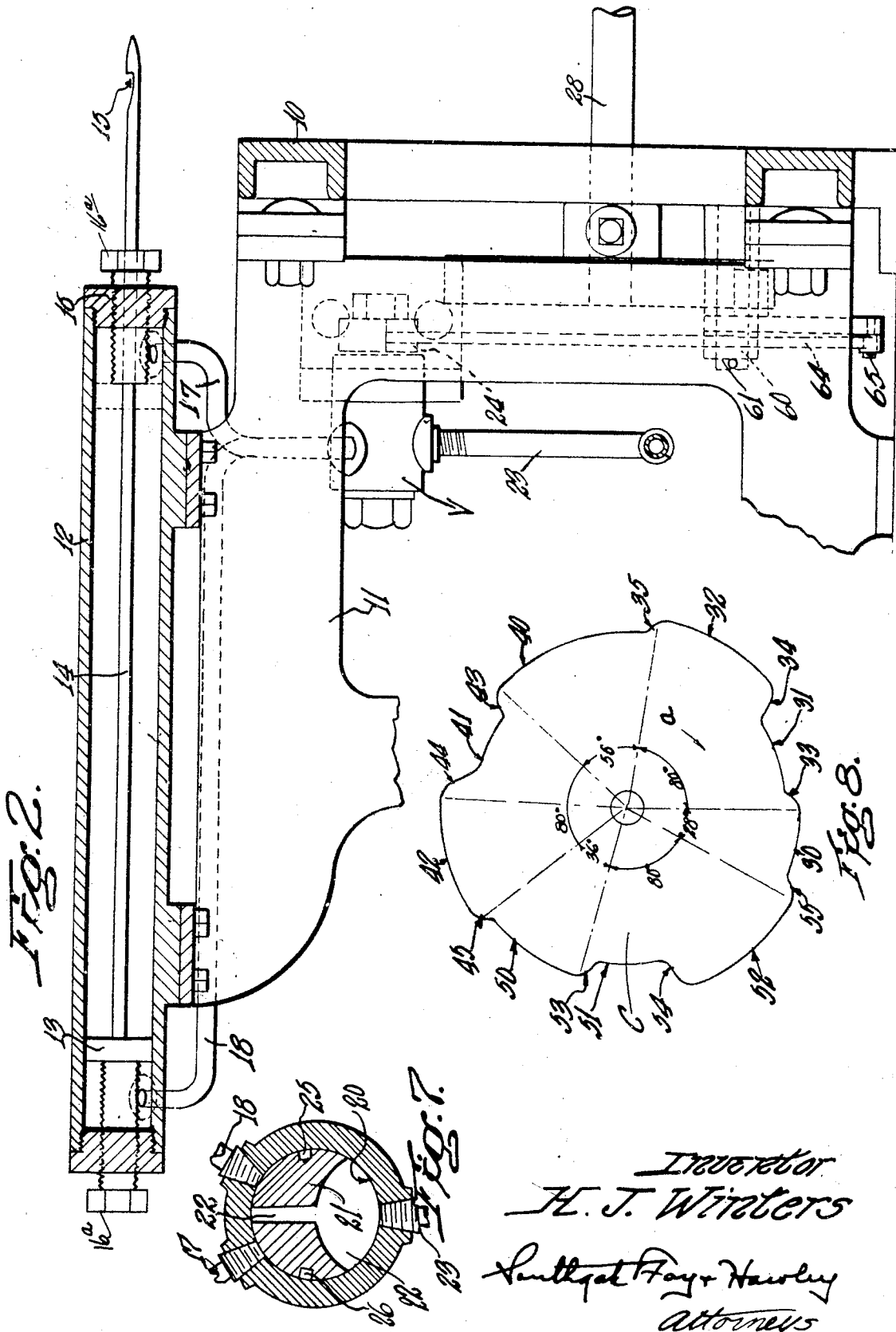
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PNEUMATIC NEEDLE MOTION FOR AXMINSTER LOOMS

Application filed June 3, 1931. Serial No 541,868.

This invention relates to improvements in needle motions for Axminster looms and it is the general object of the invention to produce the movements of the needle by compressed air.

In an Axminster loom the weft is usually led by a needle which may perform its cycle of operation in three beats of the lay. The dwells between the successive insertions of the needle in any one beat or cycle of the Smith type of loom are unequal. In a loom of this type which has gone into general use the actual movement of the lay actuating cam required for the insertion and withdrawal of the needle may be approximately 80° , and the dwells may be, respectively, 28° , 56° and 36° . It is necessary where employing a pneumatic actuator for the needle to introduce between the source of energy and the needle some form of control which will open and close the valves at unequal times corresponding to the intervals mentioned. It is accordingly an important object of my present invention to provide a control valve and actuator therefor which will complete its cycle of operations in a given number of beats of the lay.

I find it convenient to provide a single piston for the needle and to push the same inwardly by air entering the outer end of the cylinder in order to insert the needle and then to push the piston outwardly by admitting air to the inner end of the cylinder. The air which lies ahead of the piston must be exhausted and it is a further object of my invention to provide for the exhaust of the trapped air ahead of the piston in whichever direction the latter may move by mechanism acting in timed relation with the dwells.

While the needle is dwelling it should be held against endwise vibration, and it is an object of my invention to accomplish this result by leaving the valve at an intermediate point with all the parts closed.

With these and other objects in view which will appear as the description proceeds, my invention resides in the combination and arrangement of parts hereinafter described and set forth in the claims.

In the accompanying drawings, wherein a

convenient embodiment of my invention is set forth,

Fig. 1 is a side elevation of a portion of a loom having my invention applied thereto, looking at the outer end of the needle cylinder,

Fig. 2 is a view looking in the direction of arrow 2, Fig. 1, the cylinder and parts of the loom being in vertical section,

Fig. 3 is an enlarged detail horizontal section on line 3—3 of Fig. 1,

Fig. 4 is a vertical section on line 4—4 of Fig. 3;

Fig. 5 is a vertical section on line 5—5 of Fig. 3, showing the valve thrown in one direction,

Fig. 6 is a view similar to Fig. 5 but with the valve in the opposite direction,

Fig. 7 is a view similar to Fig. 5 but with the valve in an intermediate position, and

Fig. 8 is a diagrammatic view of the path of the needle actuating cam.

In the mechanism to be described hereinafter I provide a source of compressed air and a needle reciprocating pneumatic cylinder, and interpose between these two devices a control valve the position of which is determined by an element moving in timed relation with the loom. This element may comprise a cam having dwell surfaces of varying lengths and also having surfaces to open the inlet valve at one end of the cylinder and still other surfaces to open the inlet valve at the other end of the cylinder.

In carrying the invention into effect I provide a loomside 10 from which extends a needle frame 11 on which is mounted a cylinder 12. There is mounted in the latter a piston 13 to which is secured a weft laying needle 14 the end of which may be notched as at 15 in the usual manner. A head 16 on the cylinder may serve to guide the needle, and adjustable stop screws 16a in each end of the cylinder limit movement of the piston.

Near the outer end of the cylinder a supply pipe 18 is provided to furnish air under pressure to that part of the cylinder, while a second supply pipe 17 opens into the cylinder adjacent the inner end or near the head 16.

The piston travels between the pipes 17 and 18 in its reciprocating movements.

A valve designated generally at V has a bore 20 in which is rotatably mounted a valve proper 21 provided with a port 22. The valve is cut away as suggested in Fig. 5 and the port is at all times open to a feed pipe 23. The latter may be supplied with compressed air from any suitable source either independent of or operated by the loom. Pipes 17 and 18 connect with the bore of the cylinder at the left and right hand sides, respectively, as viewed in Fig. 5. The valve 21 is provided with an arm 24 by means of which it may be rocked angularly in the bore.

The valve is provided also with outlet ports 25 and 26 located at the right and left hand sides of the center of the valve, respectively, as viewed in Fig. 5. These outlet valves may communicate with openings 27 in the valve casing so that air from the cylinder may be exhausted to the atmosphere.

The valve can be held in any one of the three positions shown in Figs. 5, 6 or 7 by means of a cam C. This cam has three sets or groups of dwell surfaces connected by inclines and is mounted on a shaft 28 so geared to the loom as to make one complete revolution for every three beats of the lay. Each group includes one idle or intermediate dwell which is different in length from the corresponding dwell of the other groups, and each group contains two working dwells.

Referring particularly to Fig. 8 there are three intermediate or idle dwells 30, 40 and 50 which may correspond roughly to 28°, 56° and 36°, respectively, of angular movement of the cam or shaft 28. Assuming that the cam rotates in the direction of arrow *a*, Figs. 1 and 8, the idle dwell 30 will be followed by a low working dwell 31 and the latter in turn will be succeeded by a high working dwell 32. An incline 33 lies between dwells 30 and 31 and a second longer incline 34 lies between the dwells 31 and 32. A relatively short drop incline 35 connects dwells 32 and 40. In a similar manner, idle dwell 40 is followed by low dwell 41 and high dwell 42, successively, and inclines 43, 44 and 45 are arranged as shown in Fig. 8. The last idle dwell 50 is followed by low and high working dwells 51 and 52, respectively, which lie adjacent inclines 53, 54 and 55.

It will be seen that the intermediate or idle dwells are of varying lengths, but that the two dwells succeeding each idle dwell will be of substantially the same length. Dwell 30 may correspond to a beating-up movement of the lay preparatory to the formation of a tuft, dwell 40 which is the longest of the intermediate dwells may correspond to the wiping in of the tuft, and dwell 50 may correspond to the pulling-off or raising of the tube frame to provide yarn for the next tuft. In the so-called Smith type of Axminster

loom the manner of presenting and manipulating the tuft yarns with respect to the fabric requires these uneven lengths of dwells.

The cam cooperates with a lever 60 which may be pivoted as at 61 to fixed structure and has a roll 62 to lie in a groove of the cam C, the groove following generally the outline set forth diagrammatically in Fig. 8. The free end of the lever is connected to a rod 64 as at 65 and the upper end of the rod is attached to the arm 24 as at 66.

In describing the operation of the mechanism it may be assumed that roll 62 is on the short idle dwell 30 and that the arm 24 is in an intermediate position to place the valve as shown in Fig. 7. In this position it will be noticed that both of the supply pipes 17 and 18 are shut off from the feed pipe 23 and also the exhaust ports 25 and 26 are closed. As a result of this setting of the valve air is not able to enter or leave the cylinder 12, so that the piston is held by the air on each side thereof in the out or idle position shown in Fig. 2. As the cam rotates the roll will move to the low dwell 31 and lever 60 will raise arm 24 to a shift of the valve to the position shown in Fig. 5 with pipe 18 connected through the port 22 to the feed pipe 23. Under these conditions exhaust port 26 is exposed to pipe 17, so that air enters cylinder 12 through pipe 18 at the outer end thereof to force the piston 13 to the right as viewed in Fig. 2, thus giving the needle 14 an inward or weft laying stroke. As the piston moves to the right the air which lies in front of it will be exhausted through pipe 17 and exhaust port 26 to pass out of one of the openings 27.

The parts are so timed that as the needle reaches its extreme inward position the roll will begin to move up from the lower working dwell 31 to the high dwell 32 to effect rocking of the valve to the position in Fig. 6. This movement connects the feed pipe 23 and pipe 17 so that compressed air enters at the right of the piston to move the same outwardly, while the right hand exhaust port 25, see Fig. 6, is in register with pipe 18 to permit exhaustion through an opening 27. When the needle is fully withdrawn the roll will descend from working dwell 32 to the idle dwell surface 40, and the valve returns to the position shown in Fig. 7.

As soon as the cam has moved over the dwell 40 the operation of parts already described will again take place, the needle being inserted and withdrawn and the roll arriving at the intermediate dwell 50. Still further revolution of the cam causes a third inserting and withdrawal of the needle and the roll on the lever will again be in contact with the idle dwell 30.

It will be noted that when the roll is on each of the intermediate or idle dwells the valve will be in the position shown in Fig. 7

so that the needle will be held stationary by the air trapped in the cylinder by the valve.

From the foregoing it will be seen that I have provided a simple form of control interposed between the supply and the cylinder of a pneumatically actuated needle of an Axminster loom. The control gives the valve opening and closing movements after unequal periods of idle dwells, so as to make provision for a preliminary pick of filling, a pile yarn wiping-in beat, and a drawing-off beat.

Having thus described my invention it will be seen that changes and modifications may be made therein by those skilled in the art without departing from the spirit and scope of the invention and I do not wish to be limited to the details herein disclosed, but what I claim is:

1. In a pneumatic needle motion for an Axminster loom, a source of compressed air, an air cylinder and piston to give operative movements to the needle, a valve interposed between the source of air and the cylinder, and means to operate said valve through a cycle of movements corresponding to three beats of the loom, said means actuating the valve so as to cause three different idle dwells of the needle, said dwells being of unequal length.

2. In a pneumatic needle motion for an Axminster loom, a source of compressed air, an air cylinder and piston to give operative movements to the needle, a valve interposed between the source and the cylinder, and a controller for the valve, said controller completing its cycle of movements in a period corresponding to three beats of the loom and effective to give the valve a plurality of groups of movements, one group for each beat of the loom, each group having an idle dwell and the dwells being of unequal lengths.

3. In a pneumatic needle motion for an Axminster loom, a source of compressed air, an air cylinder and piston to give operative movements to the needle, a valve interposed between the source and the cylinder, means to give the valve three successive similar pairs of movements, one pair for each beat of the loom, and means to cause a dwell in the motion of the valve between successive pairs of movements, said dwells all being of unequal length.

4. In a pneumatic needle motion for an Axminster loom, a source of compressed air, an air cylinder and piston to give operative movements to the needle, a valve interposed between the source and the cylinder, and means to give said valve three groups of movements corresponding to three beats of the loom, each group containing two dwells of substantially the same length and a third dwell, the third dwell of each group being different from the corresponding dwell of the other two groups.

5. In a pneumatic needle motion for an Axminster loom, a source of compressed air, an air cylinder and piston to give operative movements to the needle, a valve interposed between the source and the cylinder, means to give said valve three groups of movements corresponding to three beats of the lay, each group including a movement to admit air to one end of the cylinder and another movement to admit air to the opposite end of the cylinder and a third movement corresponding to an idle dwell position, the idle dwell position for any group being of a length different from the corresponding position of either of the other two groups.

6. In a pneumatic needle motion for an Axminster loom, a source of compressed air, an air cylinder and piston to give operative movements to the needle, means to connect the source and cylinder to reciprocate the needle, and means to disconnect the source and cylinder during unequal intervals of time, said first and second means operating in succession.

7. In a pneumatic needle motion for an Axminster loom, a source of compressed air, an air cylinder and piston to give operative movements to the needle, means to connect the source and cylinder to reciprocate the needle, and means to disconnect the source and cylinder, said second means operating during three different intervals of time, one to correspond to a preparatory beat of the loom, the second to a pile yarn wiping-in movement of the loom, and the third corresponding to a pile yarn drawing-off beat of the loom.

8. In a pneumatic needle motion for an Axminster loom, a source of compressed air, an air cylinder and piston to give operative movements to the needle, means to connect the source and cylinder to reciprocate the needle, and means to disconnect the source and cylinder, said second means operating during three separate intervals of time, one to correspond to a preparatory beat of the loom, the second to a pile yarn wiping-in movement of the loom, and the third corresponding to a pile yarn drawing-off beat of the loom.

In testimony whereof I have hereunto affixed my signature.

HARRY J. WINTERS.