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Lukowicz

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[45] **May 28, 1974**

[54] **PNEUMATIC DRIVE SYSTEM FOR A SEWING MACHINE**

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[52] **U.S. Cl.** ..... **112/ 121.14,** 112/219 B

[51] **Int. Cl.** **D05b 3/00,** D05b 69/08

[58] **Field of Search** ..... 112/219 A, 219 B, 219 R, 112/220, 121.14, DIG. 2, DIG. 3, 221

[56] **References Cited**

UNITED STATES PATENTS

2,771,045	11/1956	Cash	112/121.14
3,245,369	4/1966	Myska	112/219 B
3,359,931	12/1967	Miller et al.	112/219 B
3,371,630	3/1968	Cash	112/121.14

FOREIGN PATENTS OR APPLICATIONS

497,893	12/1938	Great Britain	112/219 B

Primary Examiner—H. Hampton Hunter
Attorney, Agent, or Firm—Edith Grill

[57] **ABSTRACT**

A pneumatic drive system for controlling the stitching direction of a sewing machine including a base and having a needle bar with a sewing needle driven between uppermost and lowermost position by a motor connected to the sewing machine through a clutch comprising a main air supply, a clutch air control cylinder, a clevis assembly connecting between the clutch air control cylinder and the clutch a four-way air control valve, and various pneumatic lines interconnecting the clutch air control cylinder, the four-way air control valve and a main air regulator that connects to the main air supply, so that the sewing needle sews straight stitches as a foot pedal is depressed closing the various pneumatic lines between the main air supply and clutch air control cylinder and releasing the clutch. A brain member connects to the machine, and a jet sensor is attached to the brain member and has a structure defining a substantially U-shaped member having at least one opening in each arm through which air from the brain member flows. Various pneumatic lines and regulator valves interconnect with the main air regulator and are closed to the main air supply as a second pedal is depressed to send air to the brain member. A flag member breaks the flow of air through the openings in the arms which causes a number of flow control valves and booster valves interconnected by pneumatic lines to cause the base of the machine to oscillate and cause the sewing machine to reciprocate and sew zig-zag stitches.

6 Claims, 8 Drawing Figures

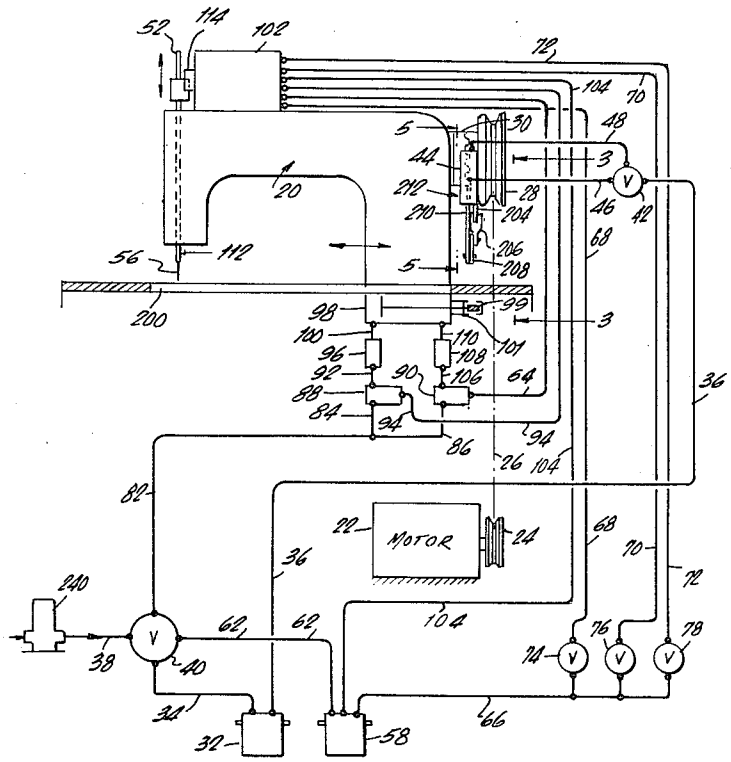


FIG. 1

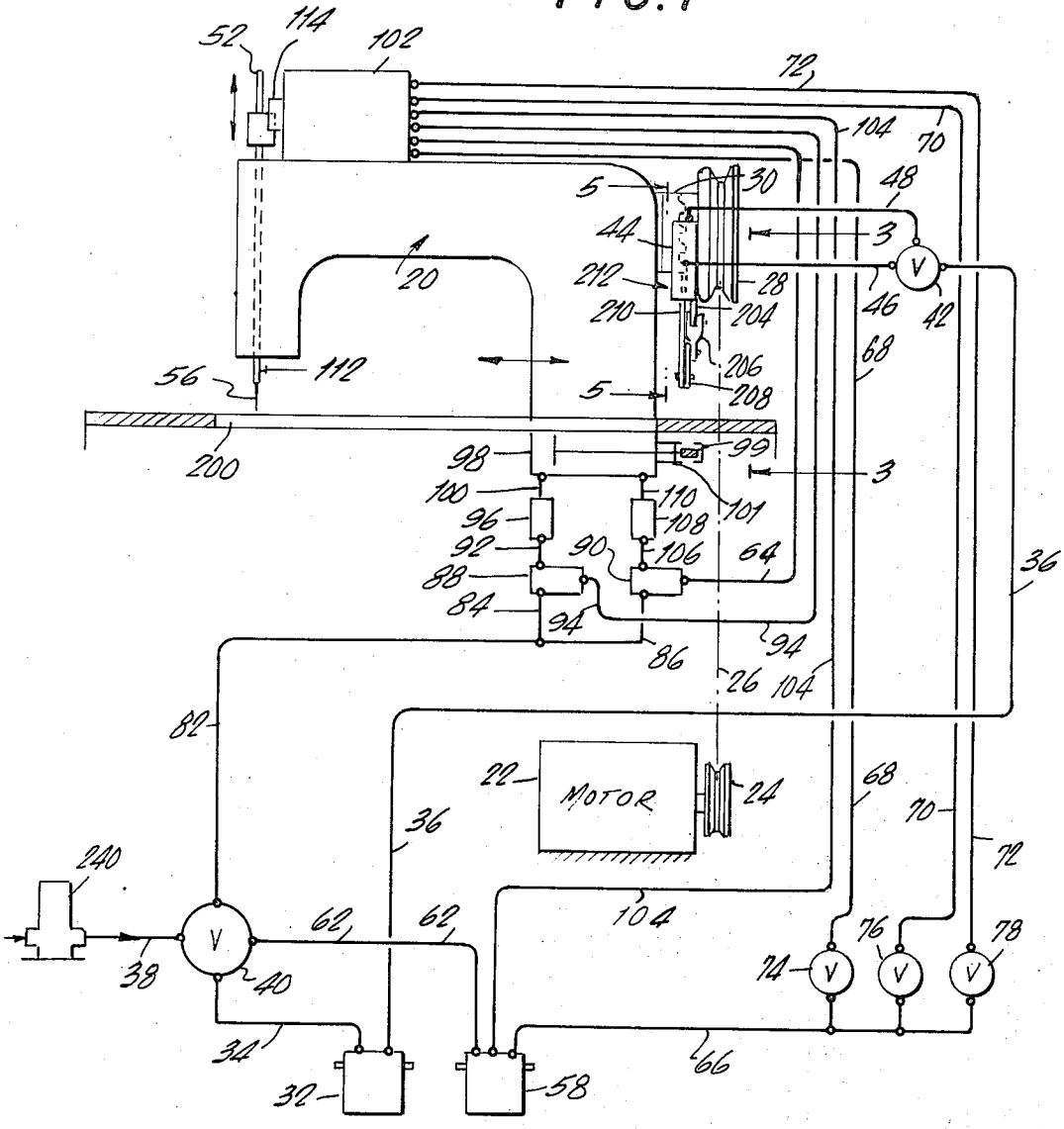
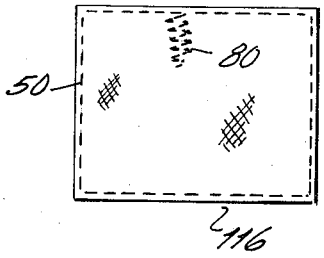


FIG. 2



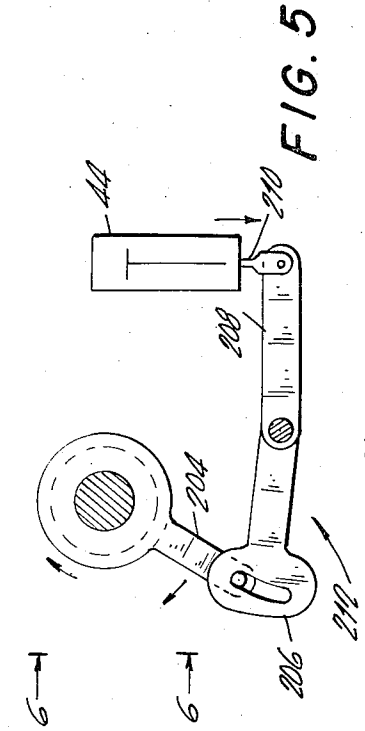


FIG. 5

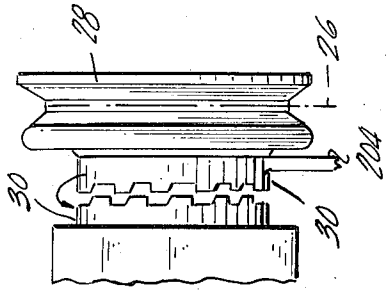


FIG. 6

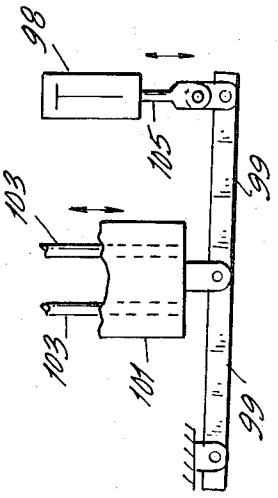


FIG. 4

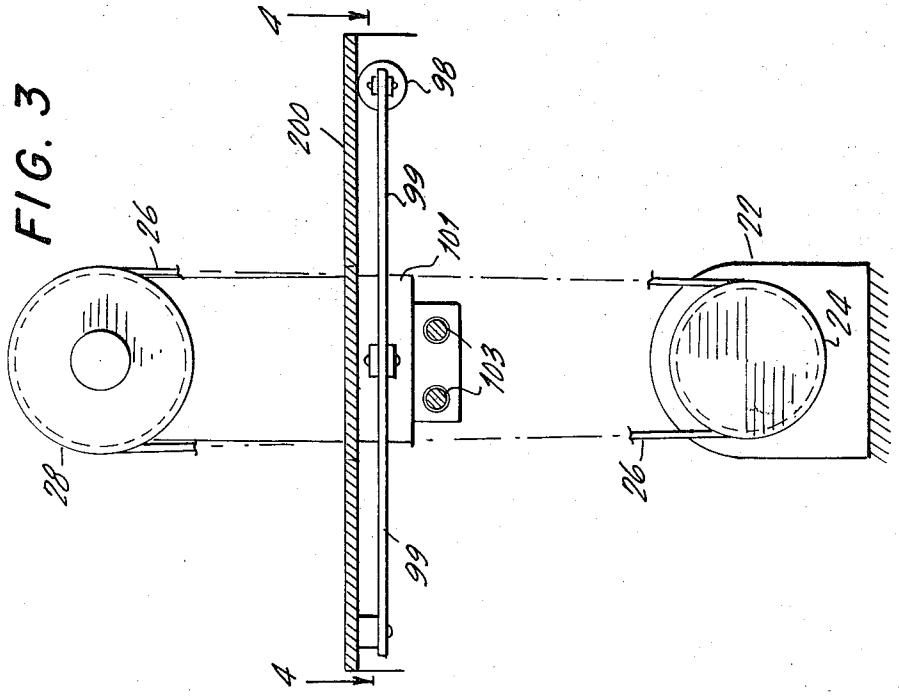


FIG. 3

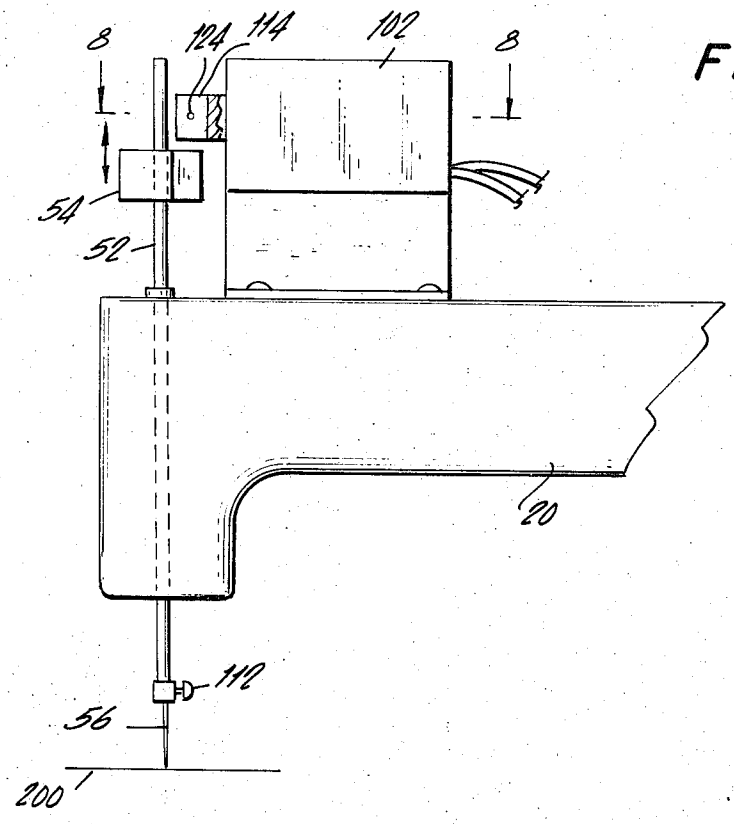

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FIG. 7

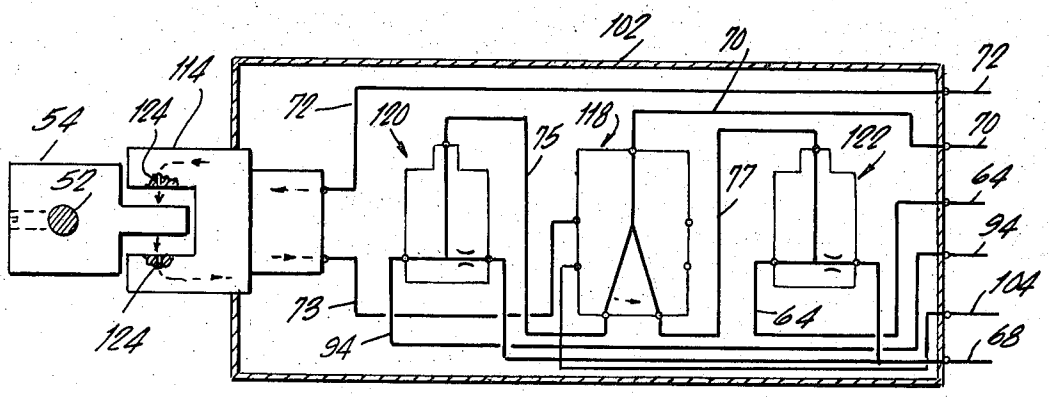

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FIG. 8

PNEUMATIC DRIVE SYSTEM FOR A SEWING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to an automatic means of sewing large zig zag stitches having a range of adjustment of ⅞ to 1 ⅛ inch on material in a 360° motion, and not requiring experienced labor to manipulate said operation.

2. Description of the Prior Art

Generally an operator must be fully experienced and be able to manipulate material to perform uniform stitches. To perform the operator must move material from left to right and forward or back at the same time. This operation or performance requires from 6 to 10 months of training time or longer. During this training time the operator must be guaranteed a minimum salary or makeup pay.

In the performance of this operation the operator must also operate a foot operated foot pedal connected to a clutch mechanism on machine with a stop and go motion (or up and down motion of foot pedal) simultaneously with left and right or forward and back motions as aforesaid.

This invention enables operator training period to be reduced to 2 days to a conservative 2 weeks, plus uniformity and neatness of product and increase of production by at least 20% or more.

The purpose of present invention is to overcome the above mentioned inconveniences and the elimination of said problems.

SUMMARY OF THE INVENTION

The present invention accomplishes its desired objects by providing a pneumatic drive system for controlling the stitching direction of a sewing machine including a base and having a needle bar with a sewing needle driven between uppermost and lowermost position by a motor connected to the sewing machine through a clutch comprising a main air supply, and means connected to the main air supply for releasing the clutch to start the sewing needle of the machine sewing straight stitches. Also provided is a means for causing the sewing machine to reciprocate and sew zig-zag stitches.

It is therefore an object of the invention to provide a sewing machine that is not required to come to a complete stop before switching from straight stitching to zig-zag, and vice versa.

The operation is carried out as follows:

Left foot pedal when depressed releases signal to four way valve, which in turn sends signal to cylinder mounted on bracket and supporting channel which contains sewing machine, to move piston mounted within cylinder downward causing clutch lever to release clutch thereby causing machine to commence sewing straight or (basting) stitch. When a zig-zag stitch is required, the right pedal must be depressed while still maintaining pressure on left pedal. This action causes compressed air from pneumatic air supply to release air to three air regulators which supply controlled air pressures to several pneumatic supply lines to several pneumatic drive devices namely Impacting Jet Sensor, Binary Counter, and two Amplifiers, which are mounted within a metal container, all constituting

a control system which in turn is mounted on a bracket which is fastened on top of machine near face or front of machine. This control system is an air switching device that is activated by a flagging device mounted on needle bar, when machine is in motion needle bar operates in an up and down motion causing flag which is mounted on needle bar to interrupt flow of air to brain thereby signalling the control system to switch flow of air to pneumatic devices mounted on air cylinder which oscillate machine, each upward stroke of needle bar changes flow of air to either side of cylinder which gives it the forward and back motion or oscillation.

It is another object of the present invention to provide a pneumatic drive system for controlling the stitching direction of a sewing machine that is durable, capable of sewing even stitches on coarse, heavy material, and which is relatively economical to manufacture and use.

These, together with various ancillary objects and features which will become apparent as the following description proceeds are obtained by this pneumatic drice system for a sewing machine, a preferred embodiment is shown in the accompanying drawings, by way of example only, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of the system according to this invention;

FIG. 2 is a top plan view of a cloth having straight and zig-zag stitches;

FIG. 3 is a fragmentary side elevational view of the invention taken along the plane of line 3—3 in FIG. 1;

FIG. 4 is a fragmentary horizontal sectional view of the machine oscillation cylinder in connection with the base of the sewing machine taken along the plane of line 4—4 in FIG. 3;

FIG. 5 is a side elevational view of the clutch air control cylinder connecting to the clutch by a clevis assembly taken along the plane of line 5—5 in FIG. 1;

FIG. 6 is a detailed fragmentary front elevational view of the clutch member looking along the plane of line 6—6 in FIG. 5;

FIG. 7 is a detailed fragmentary front elevational view showing the sensoring mechanism for oscillating the sewing machine; and

FIG. 8 is a horizontal sectional and schematic view of the sensoring mechanism taken along the plane of line 8—8 in FIG. 7.

DETAILED DESCRIPTION OF THE INVENTION

Referring in detail now to the drawings, wherein similar parts of the invention are identified by like reference numerals, a sewing machine **20** is located on sewing table **200.** The electric motor **22** is connected to a conventional source of electric power. The motor **22** having belt **26** is entrained thereabout as well as engaging driven pulley **28.** Clutch **30** engages the pulley **28** with the sewing machine **20** and is operated by depressing pedal **32** which closes pneumatic lines **34** and **36** to send fluid (preferably air) pressure to four-way air control **42** from main air regulator **40.** Fluidic pressure enters air regulator **40** through pneumatic line **38** from a main fluid reservoir **240** which is preferably a compressor. Clutch air control cylinder **44** having piston **210** receives fluid pressure from air control valve **42** through pneumatic lines **46** and **48** and transmits the

pressure to release clutch 30 through the clevis assembly, generally illustrated as 212, which includes connection bar 208, clevis 206, and clutch engaging bar 204. This starts the machine 20 sewing a straight or basting stitch 50 on cloth 116 by a needle 56 which is attached to needle bar 52 by screw member 112.

Zig-zag stitch 80 on cloth 116 may be sewed by depressing pedal 58, while still maintaining pressure on pedal 32, to start machine 20 oscillating zig-zag wise. Fluid pressure enters pneumatic line 66 as pedal 58 is depressed releasing the fluid pressure from main air regulator valve 40 through pneumatic line 62 to pedal 58. Fluid pressure in line 66 splits into regulator valves 74, 76 and 78 from where it enters brain member 102 through pneumatic lines 68, 70 and 72 respectively.

Fluid pressure also exits main air regulator valve 40 into pneumatic line 82 where it splits into pneumatic lines 84 and 86 to enter booster valves 88 and 90, respectively.

Fluid pressure leaves booster valves 88 and 90 and enters flow control valves 96 and 108 through pneumatic lines 92 and 106, respectively. Machine oscillation control cylinder 98 having piston 105 controls the zig-zag reciprocation through bar 99 of machine 20 with a base 101 resting on traveling bars 103. Oscillation control cylinder 98 is also connected to flow control valves 96 and 108 via lines 100 and 110, respectively. Pneumatic line 94 connects booster valve 88 to brain member 102, as does pneumatic line 104 connects booster valve 90.

In operation of the invention, air pressure is supplied to machine oscillation control cylinder 98 by air regulator valve 40 through the aforementioned pneumatic lines interconnecting booster valves 88 and 90 and flow control valves 96, 108 respectively. Air pressure is also supplied to brain member 102 from regulator valves 74, 76 and 78 through lines 68 to 70 and 72, respectively. By depressing pedal 32, clutch air control cylinder 44 releases clutch 30 and needle bar 52, with flag member 54 and needle 56 attached thereto, proceeds upward and downward to sew straight stitch 50. When the operator desires to sew zig-zag stitch 80, pedal 58 is depressed while still maintaining pressure on pedal 32. This supplies constant air pressure to impact jet sensor 114 having opening 124 and attached to brain member 102. Flag member 54 moves up and down on needle bar 52 and breaks the air flow through opening 124 across jet sensor 114 which comes from pneumatic lines 72 and 73. Line 73 interconnects jet sensor 114 and binary counter 118 which is connected to amplifier air valves, generally illustrated as 120 and 122, by pneumatic lines 75 and 77, respectively. Binary counter 118 causes switching of air impulses to amplifier air valves 120 and 122 as pneumatic line 73 detects the breaking of air flow across jet sensor 114 from flag member 54 moving up and down. This in turn changes the direction of the piston within machine oscillation control cylinder 98 by fluctuating air pressure through pneumatic lines 94 and 64 and booster valves 88 and 90, and thus causes machine 20 to move in a zig-zag fashion, or forward-backward motion. A reset signal 104 is provided to return the machine to a back position or stopped position.

A latitude of modification, substitution and change is intended in the foregoing disclosures, and in some instances some features of the present invention may be employed without a corresponding use of other features.

I claim:

1. A pneumatic drive system for controlling the stitching direction of a sewing machine including a base and having a needle bar with a sewing needle driven between uppermost and lowermost position by a motor connected to the sewing machine through a clutch, comprising a main air supply, means connected to said main air supply for actuating said clutch to start said sewing needle of said machine sewing straight stitches, and means for causing said sewing machine to reciprocate and sew zig-zag stitches, said means for actuating said clutch comprising a clutch air control cylinder, a clevis assembly connecting between said clutch air control cylinder and said clutch, a four-way air control valve, a first pneumatic line and a second pneumatic line each connecting between said air control valve and said clutch air control cylinder, a third pneumatic line connecting said main air supply and said air control valve, and means for releasing air from said main air supply line to said air control valve to release said air to said clutch air control cylinder causing said air control cylinder to engage said clevis assembly and release said clutch, said means for releasing air from said main air supply to said air control valve comprising a main air regulator connected within said third pneumatic line, and a pedal connected within said third pneumatic line between said main air regulator and said air control valve so that when said pedal is depressed said air is released to said air control valve, said means for causing said sewing machine to reciprocate and sew zig-zag stitches comprising a brain member connected to said machine, a jet sensor attached to said brain member and including a structure defining a substantially U-shaped member having at least one opening in each arm through which said air from said brain member flows, means for releasing air to said brain member, means for breaking the flow of air through said opening, and means for responding to said breaking of flow of air to cause said base of said machine to oscillate and cause said sewing machine to reciprocate and sew zig-zag stitches.

2. The drive system of claim 1, wherein said means for breaking the flow of air through said opening includes a flag member attached to said needle bar and situated such that when said bar is driven between uppermost and lowermost position by said motion, said flag member passes through said arms of said U-shaped jet sensor to break the flow of air from said opening in each arm.

3. The drive system of claim 1, wherein said means for releasing air to said brain member includes a second pedal, a fourth pneumatic line connecting between said main air regulator and said second pedal, a fifth pneumatic line connecting between said second pedal and said brain member, a sixth pneumatic line connecting between said second pedal, and said brain member, a first regulator valve connecting within said sixth pneumatic line between said brain member and said second pedal, a seventh pneumatic line connecting to said brain member and to said sixth line between said first regulator valve and said second pedal, a second air regulator valve connecting within said seventh pneumatic line, an eighth pneumatic line connecting to said brain member and to said sixth line and said second pedal, and a third air regulator valve connecting within said

eighth pneumatic line whereby when said second pedal is depressed air is conducted from said main air regulator through said fourth pneumatic line to said brain member by said fifth, sixth, seventh and eighth pneumatic lines.

4. The drive system of claim 3, wherein said means for responding to said breaking of the flow of air to cause said base of said machine to oscillate and cause sewing of zig-zag stitches includes a machine oscillation cylinder having a piston within, a connecting bar attached to said base of said machine and to said piston, a ninth pneumatic line connected between said main air regulator and said machine oscillation cylinder, a first flow control valve connected within said ninth pneumatic line between said oscillation cylinder and said air regulator, a first booster valve connected within said ninth pneumatic line between said first control valve and said air regulator, a tenth pneumatic line connecting from said oscillation cylinder to said ninth pneumatic line between said first booster valve and said air regulator, a second booster valve connecting within said tenth pneumatic line, a second flow control valve connecting within said tenth pneumatic line between said second booster valve and said oscillation cylinder, an eleventh pneumatic line connecting from said second booster valve to said brain member and a twelfth pneumatic line connecting from said first booster valve to said brain member.

5. The drive system of claim 4, wherein said brain member comprises said sixth pneumatic line connecting to said jet sensor, a binary counter connecting to said seventh pneumatic line, a thirteenth pneumatic line connecting from said jet sensor to said binary counter, a first amplifier air valve, a fourteenth pneumatic line connecting between said binary counter and said first amplifier air valve, a second amplifier air valve, a fifteenth pneumatic line connecting between said binary counter and said second amplifier a air valve, said fifth line connecting to said fifteenth line within said second amplifier valve and connecting to said eighth line which connects to said fourteenth line within said first amplifier air valve, said eighth line also connecting between said first amplifier air valve and said eleventh and said twelfth lines so that said binary counter causes switching of air impulses to said first and said second amplifier air valvues as said thirteenth line detects the breaking of air flow across said jet sensor by said flag member, which changes the direction of said piston within said oscillation cylinder by fluctuating air pressure through said eleventh line, said second booster valve, said tenth line, said second flow control valve, said twelfth line, said first booster valve, said first control valve causing said machine to move in a zig zag fashion and sew zig-zag stitches.

6. A pneumatic drive system for controlling the stitching direction of a sewing machine including a base and having a needle bar with a sewing needle driven between uppermost and lowermost position by a motor connected to the sewing machine through a clutch, comprising a main air supply, means connected to said main air supply for actuating said clutch to start said sewing needle of said machine sewing straight stitches, and means for causing said sewing machine to reciprocate and sew zig-zag stitches, said means for causing said sewing machine to reciprocate and sew zig-zag stitches comprising a brain member connected to said machine, a jet sensor attached to said brain member and including a structure defining a substantially unitary U-shaped member having at least one opening in each arm through which said arm from said brain member flows, means for releasing air to said brain member, means for breaking the flow of air through said opening, and means or responding to said breaking of flow of air to cause said base of said machine to oscillate and cause said sewing machine to reciprocate and sew zig-zag stitches.

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