Jan. 17, 1967 G. BONIS 3,298,341

SEWING MACHINE CONTROL SYSTEM

Filed Oct. 5, 1964

Fig. 1

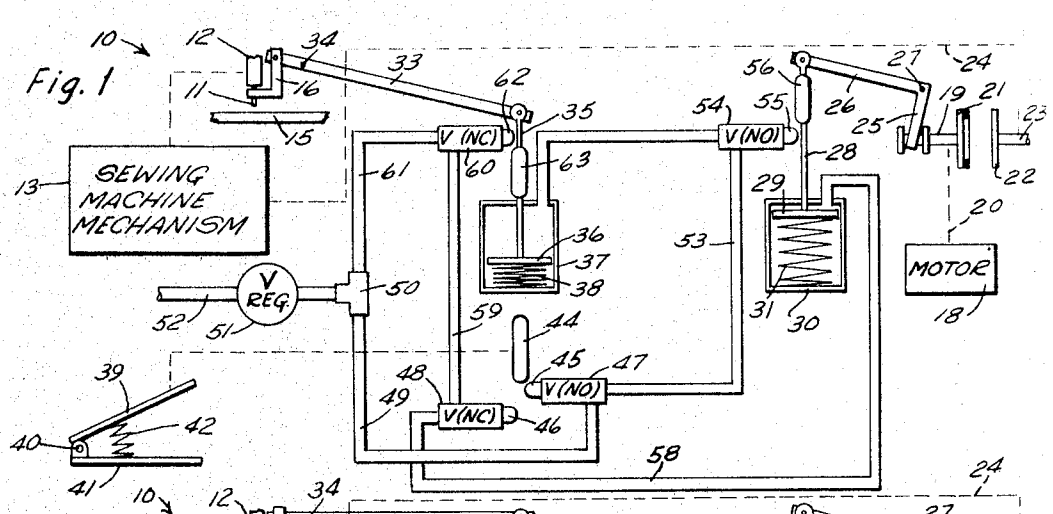


Fig. 2

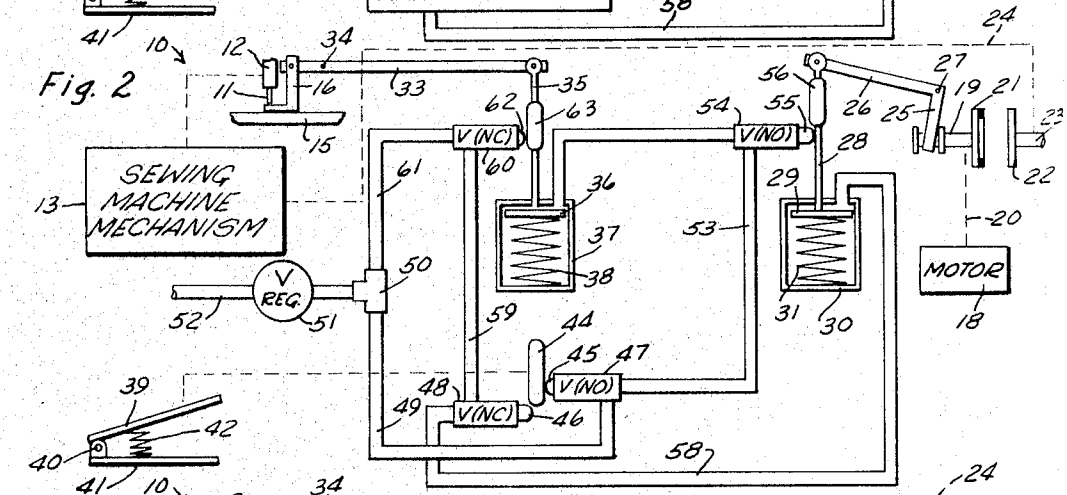
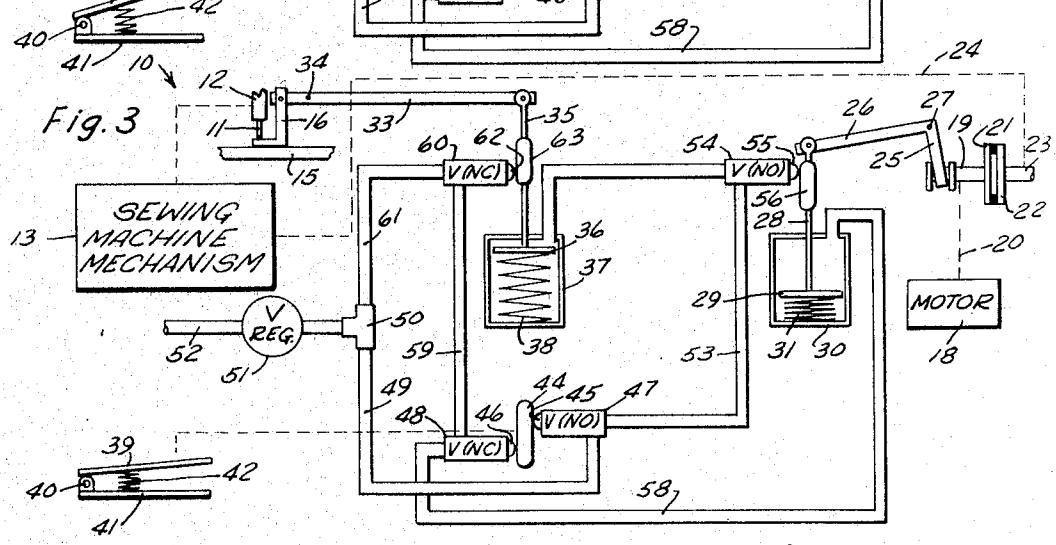


Fig. 3



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SEWING MACHINE CONTROL SYSTEM

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6 Claims. (Cl. 112—219)

This invention relates to a sewing machine control system which operates to insure proper operation of a sewing machine without jamming and which is safe and reliable in operation while being comparatively simple and readily constructed.

This invention was evolved with the general object of providing a simple, reliable and foolproof system for automatic operation of a sewing machine without jam-ups and down-time encountered with prior art machines. In such machines, jam-ups have often resulted due to activation of drive means for the needle operating mechanism while the pressure foot is in a released position, the pressure foot being provided for holding fabrics while sewing. In addition to annoyances to the operators, such jam-ups have been the cause of a large amount of down-time and have been quite expensive in factory-type operations.

According to this invention, an operator's control is connected to drive means for a needle-operating mechanism and to a pressure foot for activating the drive means after operating the pressure foot to a holding position and for operating the pressure foot to a released position after deactivation of the drive means. With this arrangement, the pressure foot is down in its fabric-engaging position when the needle is operated, to prevent jam-ups which might otherwise occur.

According to a specific feature of the invention, the pressure foot is operated to its holding position at an intermediate position of the operator's control, between a normal position and an operating position thereof, and the pressure foot is operated to its released position with movement of the control from the intermediate position toward the normal position, while the drive means for the needle-operating mechanism is activated in response to movement of the control to its operating position and is deactivated in response to movement of the control from the operating position toward the intermediate position. Thus the desired sequence of operation is obtained directly in response to movement of the operator's control.

Important features of the invention relate to the provision of means whereby movement of the pressure foot to its holding position is positively required before activation of the drive means can take place, and in the provision of means whereby deactivation of the drive means is positively required before movement of the pressure foot to its released position can take place. Preferably, a highly reliable fluid-operated system is provided for providing such positive safeguards against jamming of the sewing machine. In particular, a normally closed valve which is opened in response to movement of the pressure foot to its holding position is connected in series with another normally closed valve which is opened in response to movement of the operator's control to its operating position, to supply fluid to a fluid-operated means for activating the drive means for the needle-operating mechanism. In addition, a normally open valve which is closed in response to activation of the drive means is connected in series with another normally open valve which is closed in response to movement of the operator's control to an intermediate position, for cutting off the supply of fluid to fluid-operated means which operates the pressure foot to its released position. Preferably, and in accordance with a further specific feature, spring means are provided for urging the pressure foot to its fabric holding position, and additional spring means

are provided for urging the drive means to its deactivated position.

This invention contemplates other objects, features and advantages which will become more fully apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate a preferred embodiment and in which:

FIGURE 1 is a diagrammatic view illustrating a sewing machine control system constructed according to the principles of this invention, the elements of the system being illustrated with an operator's control in a normal condition;

FIGURE 2 is a view like FIGURE 1, but with the elements being ilustrated with the operator's control in an intermediate position; and

FIGURE 3 is another view like FIGURE 1, but with the elements illustrated with the operator's control in an operating position.

Referring to the drawings, reference numeral **10** generally designates a sewing machine control system constructed according to the principles of the invention. The system is utilized in conjunction with the conventional comprises a needle **11** carried by a holder **12** which is reciprocably driven by a sewing machine mechanism **13** which may include other conventional elements.

Fabric to be sewed is held against a support **15** by a pressure foot **16**.

Drive means are provided for the mechanism **13** comprising a motor **18** which is mechanically coupled to a shaft **19**, as diagrammatically illustrated by dotted line **20**, with a clutch element **21** being carried by the shaft **19** for engagement with a second clutch element **22** on a shaft **23** mechanically coupled to the sewing machine mechanism **13**, as diagrammatically indicated by the dotted line **24**.

For controlling engagement of the clutch elements **21** and **22**, the shaft **19** is axially movable by means of a conventional shifting dog **25** connected to a lever **26** pivotal on a shaft **27**. The end of lever **26** is connected to the upper end of a connecting rod **28** connected at its lower end to a piston **29** movable in a cylinder **30**. The piston is urged upwardly by a spring **31** to disengage the clutch elements **21** and **22**, but may be moved downwardly by admission of compressed air or other fluid into the upper end of the cylinder **30**, to effect engagement of the clutch elements **21** and **22**, and thereby activate the drive means for the sewing machine mechanism **13**.

To control movement of the pressure foot **16**, it is connected to one end of a lever **33** pivoted at an intermediate point on a shaft **34** and having its other end connected to the upper end of a connecting rod **35** which is connected at its lower end to a piston **36** movable in a cylinder **37**. A compression spring **38** is disposed within the cylinder **37** to urge the piston **36** upwardly and to move the pressure foot downwardly into a fabric-holding position. However, the piston **36** is normally urged downwardly to a position as illustrated in FIGURE 1, by admission of compressed air or other fluid to the upper end of the cylinder **37**.

For control of the system, an operator's control is provided in the form of a foot pedal **39** pivotal on a shaft **40** supported from a fixed support **41**, with the foot pedal **39** being urged upwardly by the compression spring **42**. The foot pedal **39** controls a cam lobe **44** operative to engage buttons **45** and **46** of a normally open valve **47** and a normally closed valve **48**.

In general, when the foot pedal **39** is in a normal position as illustrated in FIGURE 1, compressed air is supplied through the valve **47** to the cylinder **37**, to lower the piston **36** and raise the pressure foot **16**, while with the valve **48** being closed, no compressed air is supplied

to the cylinder 30, and the piston 29 is moved upwardly by the compression spring 31 to disengage the clutch elements 21 and 22. At an intermediate position of the foot pedal 39, as illustrated in FIGURE 2, the normally open valve 47 is closed to cut off the supply of compressed air to the upper end of the cylinder 37, and to allow the piston 36 to be raised by the compression spring 38, so as to move the pressure foot 16 downwardly to a fabric-holding position. The valve 48, however, remains closed so that the clutch elements 21 and 22 are disengaged.

When the foot pedal 39 is moved fully downwardly to an operating position as illustrated in FIGURE 3, the cam lobe 44 is engaged with both of the buttons 45 and 46 to close the normally open valve 47 and to open the normally closed valve 48, so that the pressure foot 16 is held in its fabric-holding position, while compressed air is supplied through the valve 48 to the upper end of the cylinder 30 to move the piston 29 downwardly and to engage the clutch elements 21 and 22.

For supplying compressed air to the valve 47, it is connected through a conduit 49 to a T-fitting 50 connected to the outlet of a pressure regulator valve 51 having an inlet connected through a conduit 52 to a suitable compressed air source.

In accordance with an important feature of the invention, the valve 47 is connected through a conduit 53 to a normally open valve 54 connected through a conduit 55 to the upper end of the cylinder 37. The normally open valve 54 has an actuating button 55 engageable by a cam lobe 56 on the connecting rod 28, when the piston 29 is moved downwardly. With this arrangement, the valve 54 is opened only when the piston 29 is elevated, and the pressure foot 16 can be moved upwardly to a released position only when the clutch elements 21 and 22 are disengaged.

According to another important feature of the invention, the valve 48 is connected through a conduit 58 to the upper end of the cylinder 30 and is connected through a conduit 59 to a normally closed valve 60 connected through a conduit 61 to the T-fitting 50. The normally closed valve 60 has an actuating button 62 engageable by a cam lobe 63 on the connecting rod 35 when the piston 36 is elevated. The valve 60 is thus opened and compressed air can be supplied to the cylinder 30 to engage the clutch elements 21 and 22 only when the piston 36 has been elevated to move the pressure foot 16 downwardly to its fabric-holding position.

It will be noted that should the compressed air fail in any line leading to the cylinder 30, the only thing that can happen is that the clutch elements 21 and 22 would disengage and the sewing machine mechanism would be stopped. If for any reason the air should fail in any line leading to the cylinder 37, the only thing that can happen is that the pressure foot 16 would remain down since pressure is required to raise it. In no case can the needle be operated without the pressure foot being down, and jam-ups and downtime are avoided.

This invention thus provides a sewing machine control system which operates to insure proper operation of a sewing machine without jamming and which is safe and reliable in operation while being comparatively simple and readily constructed.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of this invention.

I claim as my invention:

1. In a sewing machine including a needle, a mechanism for operating said needle, drive means for said mechanism, and a pressure foot operable from a released position to a normally resiliently biased fabric-holding position, an operator's control movable from a normal position through an intermediate position to an operating position, first fluid means connected to said control and to said pressure foot regulating the movement of said pressure foot to said fabric-holding position in response to movement of said control from said normal position to said intermediate position and for operating said pressure foot to said released position in response to movement of said control from said intermediate position toward said normal position, second fluid means connected to said operator's control and said drive means regulating the movement of said drive means in response to movement of said control to said operating position from a normally resiliently biased non-operating position and for deactivating said drive means in response to movement of said control from said operating position toward said intermediate position and fluid interlock means separate from said first and second fluid means connected to said second fluid means responsive to activation of said pressure foot regulating operation of the drive means whereby when said pressure foot is in the released position the drive means is held in an inoperative position.

2. In a sewing machine including a needle, a mechanism for operating said needle, drive means for said mechanism, and a pressure foot operable from a released position to a fabric-holding position, an operator's control movable from a normal position through an intermediate position to an operating position, resilient means urging said pressure foot toward said fabric-holding position, first fluid means connected to said operator's control and to said pressure foot for operating said pressure foot to said fabric-holding position in response to movement of said control from said normal position to said intermediate position and for operating said pressure foot to said released position in response to movement of said control from said intermediate position toward said normal position, second fluid means connected to said operator's control and said drive means for activating said drive means in response to movement of said control to said operating position and for deactivating said drive means in response to movement of said control from said operating position toward said intermediate position, first fluid interlock means responsive to activation of said drive means acting on the means connected to said control and the pressure foot preventing operation of said pressure foot to said released position while said drive means is activated and second fluid interlock means responsive to activation of said pressure foot preventing operation of the drive means when said pressure foot is in the released position.

3. In a control system for a sewing machine including a needle, a mechanism for operating said needle, drive means for said mechanism, a pressure foot operable from a released position to a fabric-holding position and an operator's control movable from a normal position through an intermediate position to an operating position, said control system including first spring means for operating said pressure foot to said fabric-holding position, second spring means operated in conjunction with said drive means for urging said drive means to a deactivated condition, first fluid-operated means for operating against said first spring means to operate said pressure foot to said released position, second fluid-operated means operating against said second spring means for activating said drive means, a source of fluid under pressure, a normally open valve connecting said source of fluid under pressure to said first fluid-operated means, a normally closed valve connected between said source of fluid under pressure and said second fluid-operated means, means coupled to said operator's control and operable in response to movement thereof to said intermediate position for closing said normally open valve and operable in response to movement of said control to said operating position for opening said normally closed valve a second normally closed valve in series with said first normally closed valve between said valve and said source of pressure arranged to be opened upon movement of said pressure foot to said fabric holding position whereby fluid from said source of pressure may reach said first

normally closed valve, and a second normally open valve between said first normally open valve and said first fluid operated means arranged to be closed in response to activation of said drive means whereby to hold said first fluid operated means against movement while said drive means is activated.

4. In a control system for a sewing machine including a needle, a mechanism for operating said needle, drive means for said mechanism, a pressure foot operable from a released position to a fabric-holding position, and an operator's control movable from a normal position through an intermediate position to an operating position, said control system including first spring means for operating said pressure foot to said fabric-holding position, second spring means operated in conjunction with said drive means for urging said drive means to a deactivated condition, first fluid-operated means for operating against said first spring means to operate said pressure foot to said released position, second fluid-operated means operating against said second spring means for activating said drive means, a source of fluid under pressure, a normally open valve connecting said source of fluid under pressure to said first fluid-operated means, a normally closed valve connected between said source of fluid under pressure and said second fluid-operated means, means coupled to said operator's control and operable in response to movement of said control to said operating position for closing said normally open valve and operable in response to movement of said control to said operating position for opening said normally closed valve, and a second normally closed valve connected in series with said first normally closed valve between said valve and said source of pressure and arranged to be opened upon movement of said pressure foot to said fabric-holding position whereby fluid from said source of pressure may reach said first normally closed valve.

5. In a control system for a sewing machine including a needle, a mechanism for operating said needle, drive means for said mechanism, a pressure foot operable from a released position to a fabric-holding position and an operator's control movable from a normal position through an intermediate position to an operating position, said control system including first means for operating said pressure foot to said fabric-holding position, second means operated in conjunction with said drive means for urging said drive means to a deactivated condition, first fluid-operated means for operating against said first means to operate said pressure foot to said released position, second fluid-operated means operating against said second means for activating said drive means, a source of fluid under pressure, a normally open valve connecting said source of fluid under pressure to said first fluid-operated means, a normally closed valve connected between said source of fluid under pressure and said second fluid-operated means, means coupled to said operator's control and operable in response to movement thereof to said intermediate position for closing said normally open valve and operable in response to movement of said control to said operating position for opening said normally closed valve, a second normally closed valve in series with said first normally closed valve between said valve and said source of pressure arranged to be opened upon movement of said pressure foot to said fabric-holding position whereby fluid from said source of pressure may reach said first normally closed valve, and a second normally open valve between said first assembly open valve and said first fluid operated means arranged to be closed in response to activation of said drive means whereby to hold said first fluid operated means against movement while said drive means is activated.

6. In a control system for a sewing machine including a needle, a mechanism for operating said needle, drive means for said mechanism, a pressure foot operable from a released position to a fabric-holding position and an operator's control movable from a normal position through an intermediate position to an operating position, said control system including first means for operating said pressure foot to said fabric-holding position, second means operated in conjunction with said drive means for urging said drive means to a deactivated condition, first fluid-operated means for operating against said first means to operate said pressure foot to said released position, second fluid-operated means operating against said second means for activating said drive means, a source of fluid under pressure, a normally open valve connecting said source of fluid under pressure to said first fluid-operated means, a normally closed valve connected between said source of fluid under pressure and said second fluid-operated means, means coupled to said operator's control and operable in response to movement thereof to said intermediate position for closing said normally open valve and operable in response to movement of said control to said operating position for opening said normally closed valve, and a second normally closed valve connected in series with said first normally closed valve between said valve and said source of pressure and arranged to be opened upon movement of said pressure foot to said fabric-holding position whereby fluid from said source of pressure may reach said first normally closed valve.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,298,341 January 17, 1967

George Bonis

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 14, for "ilustrated" read -- illustrated --; line 22, after "conventional" insert -- sewing machine which as diagrammatically illustrated --; column 5, line 27, after "movement" strike out "of said control to said operation" and insert instead -- thereof to said intermediate --.

Signed and sealed this 7th day of November 1967.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents