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F. N. ROSS ET AL

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AUTOMATIC STOP MECHANISM FOR MACHINES

Filed Aug. 11, 1932

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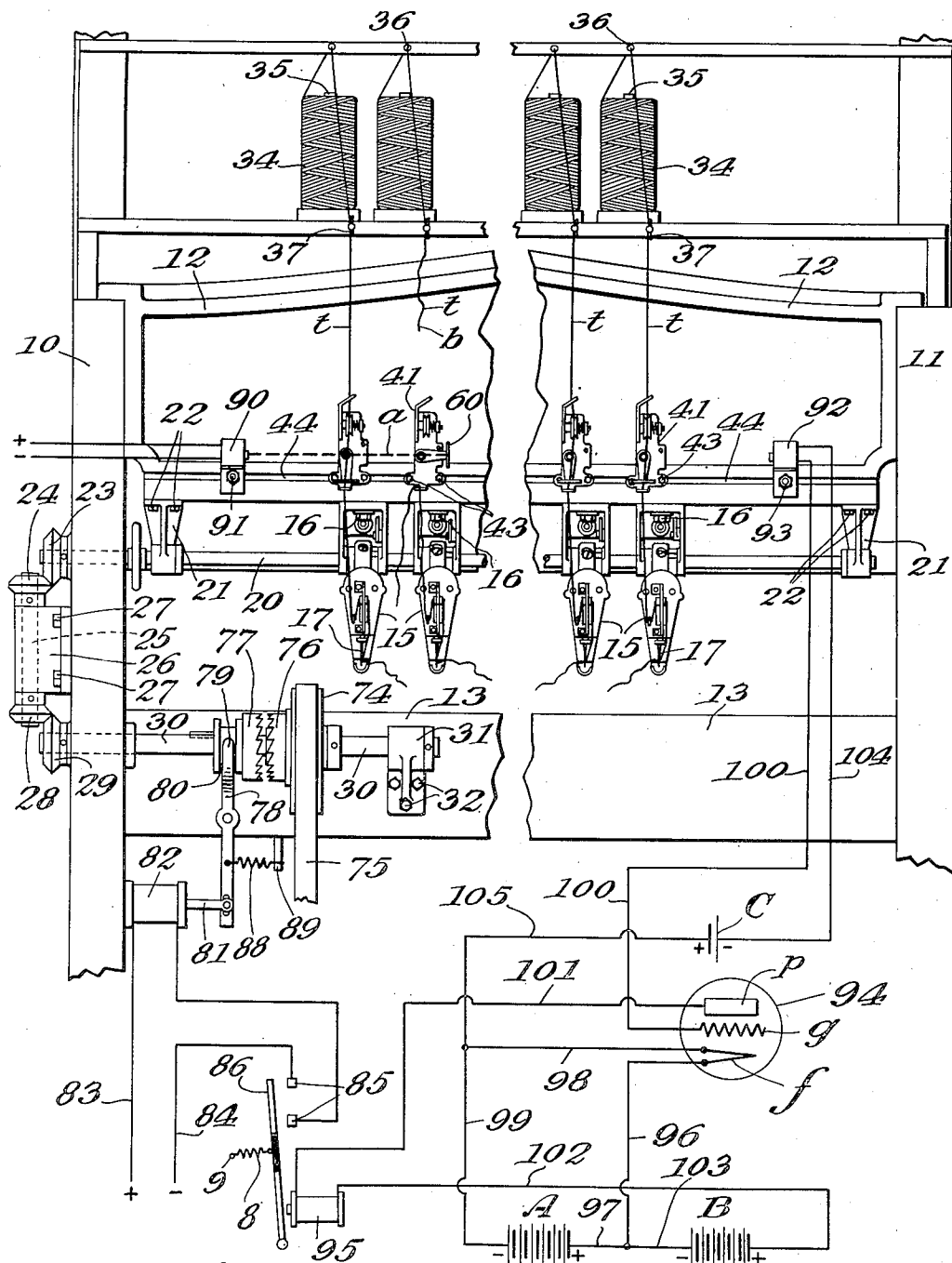


Fig. 1

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Fig. 2

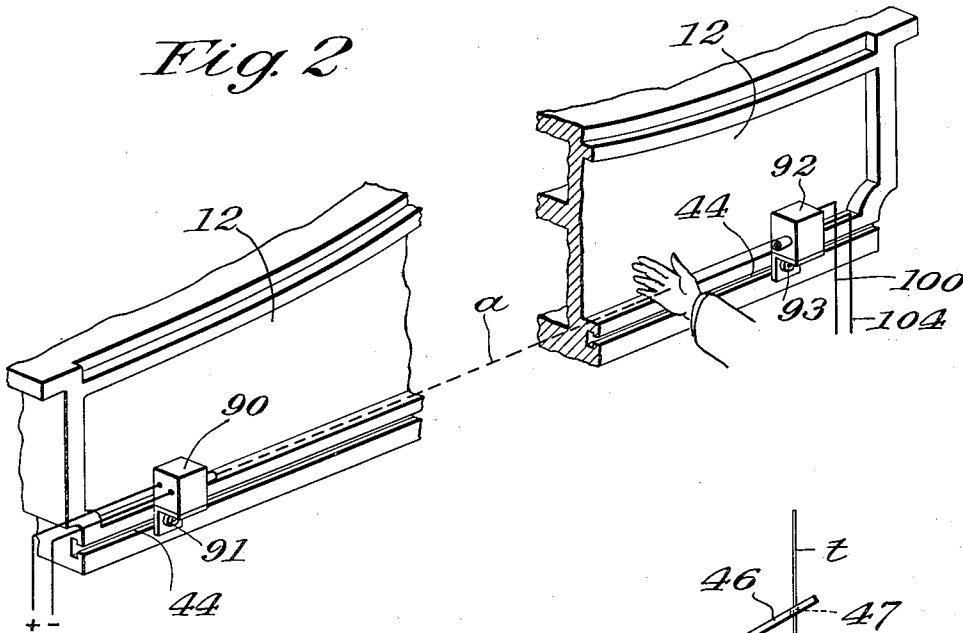


Fig. 4

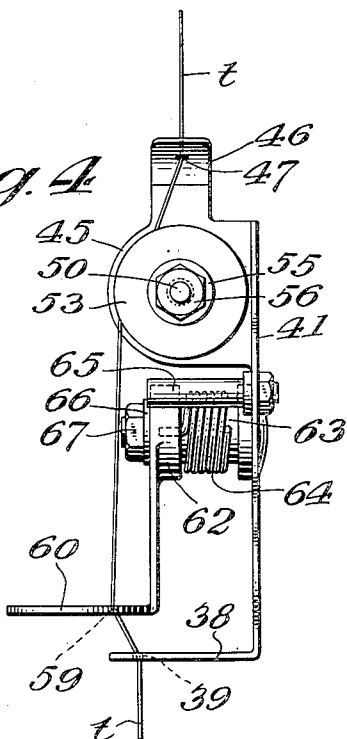
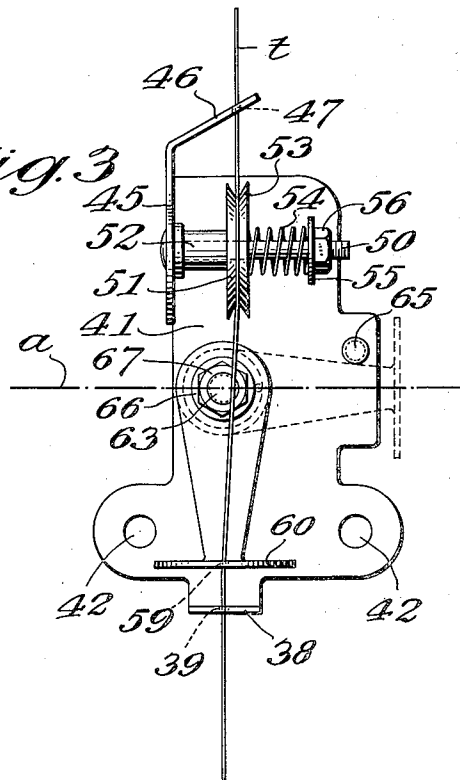


Fig. 3



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UNITED STATES PATENT OFFICE

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AUTOMATIC STOP MECHANISM FOR
MACHINES

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Application August 11, 1932, Serial No. 628,384

6 Claims. (Cl. 112-219)

A large proportion of the upholstery for automobile seat cushions is produced by machines. These machines are provided with a plurality of sewing units. Feed mechanism is provided for feeding a finish fabric, a lining fabric and strips of stuffing, such as cotton bat, past the sewing units. As these materials are fed toward the sewing units, the finish fabric is gathered in to provide a plurality of longitudinally extending tubes enclosing the strips of cotton bat. The sewing units unite the fabrics by a line of stitching between adjacent tubes. The supply of thread to one or more of the sewing units often fails or breaks and is not discovered immediately by the operator. Consequently, the feeding of the materials past the sewing units continues for some time and the upholstery produced is defective by containing one or more incomplete lines of stitching. Similar difficulties often occur in gang machines of other types for a wide variety of purposes.

The present invention contemplates the provision of means for detecting immediately the defective operation of such machines and for stopping their operation automatically so that the trouble may be corrected. The invention is adapted for a wide variety of uses and when embodied in gang machines or any other type of machine may serve to enable the operator to stop the operation of the machine regardless of his position. In general, the invention contemplates the provision of a light sensitive device, such as a photoelectric cell, mounted upon the machine so as to receive a beam of light thrown across the machine, from a source of light also mounted upon the machine. The light sensitive device, actuates an electrically operable mechanism for connecting the movable parts of the machine with a source of power. This mechanism is actuated automatically by mechanical means to disconnect the movable parts of the machine and the source of power when the light sensitive device is de-energized by placing an obstruction between the light source and the light sensitive device. Thus, the operator may stop the machine immediately, regardless of his position, by intercepting the beam of light with his hand. One or more members, each operatively associated with one or more units of the machine, may be arranged to move into the path of the light beam when a unit of the machine fails to function properly. During the normal operation of the machine these members are maintained out of the path of the light beam.

The invention will be more clearly understood

from the following description in conjunction with the accompanying drawings, in which:

Fig. 1 is an elevational view of a portion of a machine embodying the invention in which a portion of the mechanism is shown in diagram.

Fig. 2 is a fragmentary perspective view of a portion of the machine.

Fig. 3 is an elevational detail view similar to Fig. 1 of a portion of the machine, and

Fig. 4 is an elevational view of the portion of the machine shown in Fig. 3 as viewed from the right of Fig. 3.

Before explaining in detail the present invention, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practised or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention beyond the terms of the several claims hereto appended as considered in view of the prior art and the requirements thereof.

The invention is illustrated in the accompanying drawings as applied to a gang sewing machine, although it is equally applicable to other types of machines having a single unit adapted to perform a single complete individual operation or to machines having a plurality of instrumentalities which perform similar functions in conjunction with one or more other instrumentalities of the machines. The machine illustrated is similar in construction to that described in a copending application Serial No. 578,630, filed December 3, 1931, and comprises a frame having vertical side members 10 and 11 connected by cross members 12 and 13. A plurality of sewing heads 15 each forming a part of a separate sewing unit are adjustably secured to the cross member 12 by bolts 16 having a T-shaped head (not shown) engaging a similarly shaped slot (not shown) in the cross member 12. Each of the sewing heads 15 is provided with a reciprocating needle 17 which is actuated by suitable mechanism within the sewing head (not shown) operatively connected to a shaft 20 rotatably mounted in bearings formed in brackets 21 suitably secured to the cross member 12 by bolts 22. One end of the shaft 20 is provided with a bevel gear 23 engaging a bevel gear 24 upon a shaft 25 mounted for rotation in suitable bearings in a bracket 26 suitably secured to the frame member 10 by bolts 27. A bevel gear

28 fixed upon the other end of the shaft 25 engages the bevel gear 29 fixed upon one end of a main drive shaft 30 mounted for rotation in suitable bearings formed in the frame member 10 and in a bracket 31 suitably secured to the cross member 13 by bolts 32.

A thread tensioning device is adjustably mounted upon the cross member 12 above each of the sewing heads 15 and comprises a main body or plate 41 provided with a pair of holes 42 for receiving bolts 43 provided with T-shaped heads adapted to engage a similarly shaped slot 44 in the cross member 12. Each plate 41 is provided with an ear 45 projecting vertically from one edge thereof and having an inwardly bent portion 46 in which a thread guide opening 47 is provided. A stud 50 is suitably secured in the ear 45 and extends inwardly over the plate 41. A disk 51 surrounds the stud 50 and is provided with a hub 52 which is keyed to the stud 50. A disk 53 is rotatably mounted upon the stud 50 and is urged towards the disk 51 by a spring 54 surrounding the stud with one end engaging the disk 53 and its other end engaging a washer 55 held upon the end of the stud by a nut 56. The bottom edge of each plate 41 is provided with an ear 38 extending horizontally therefrom and having a thread guide opening 39. Cops or spools 34 are mounted upon spindles 35 carried at the top of the frame of the machine and are arranged to supply a thread *t* to guides 36 and 37 and thence between the disks 51 and 53 to the needles 17 of the sewing heads.

A pulley 74 rotatably mounted upon the main drive shaft 30 is operatively connected with a source of power, such as a motor (not shown), by a belt 75. The pulley 74 is provided with a clutch element 76 adapted to be engaged by a clutch element 77 slidably keyed upon the main drive shaft 30 and movable into or out of engagement with the clutch element 76. One end of a lever 78 pivotally mounted upon the cross member 13 is provided at one end with a fork 79 adapted to embrace a groove 80 in the clutch element 77. The other end of the lever 78 is pivotally connected to the outer end of a plunger 81 of a solenoid 82 which is supplied with suitable electrical energy through the leads 83 and 84. A spring 88 connected at one end to a stud 89 secured in the cross member 13 is connected at its other end to the lever 78 so as normally to move the clutch element 77 out of engagement with the clutch element 76. A switch is provided in the lead 84 and comprises spaced contacts 85 adapted to be engaged by a movable switch arm 86. A spring 8 connected at one end to the arm 86 and at its other end to a stud 9 on the frame of the machine normally holds the arm 86 out of engagement with the contacts 85.

In accordance with the invention a source of light, such as a lamp 90, is secured near one end of the cross member 12 by a bolt 91 having a T-shaped head engaging the slot 44. The lamp 90 is adapted to throw a beam of light across the machine adjacent the threads *t*. A light sensitive device, such as a photoelectric cell 92, is secured near the other end of the cross member 12 so as to receive the beam of light from the lamp 90 by a bolt 93 having a T-shaped head engaging the slot 44. The photoelectric cell 92 is connected in a circuit which includes an amplifying tube 94 and an electrically operable device 95, such as an electro-magnet, adapted when energized to move the switch arm 86 into engagement with the spaced contacts 85. The filament *f* of the amplifying tube 94 is operatively connected with a battery

A by a lead 96 connected with a lead 97 and by leads 98 and 99. The grid *g* of the amplifying tube is connected by a lead 100 with the anode (not shown) of the photo-electric cell 92. A lead 101 connects the plate *p* of the amplifying tube with the electro-magnet 95 which in turn is connected by a lead 102 with the positive terminal of a battery B, the negative terminal of which is connected by a lead 103 with the lead 96. The cathode (not shown) of the photo-electric cell is connected by a lead 104 with the negative terminal of a battery C while the positive terminal of the latter is connected by a lead 105 with the lead 98.

In the embodiment of the invention illustrated means is provided adapted to form an obstruction in the path of the light beam when one of the threads *t* breaks. For this purpose, a shutter 60 is movably carried by each of the tension devices and extends from one end of an arm 61 and is provided with a thread guide opening 59. The other end of the arm 61 is provided with a hub 62 rotatably mounted upon a stud 63 suitably fixed in the plate 41. A spring 64 surrounds the stud 63 with one end fixed in the stud and the other end fixed in the hub 62 and is adapted normally to urge the arm 61 against a stop 65 carried by the plate 41. A washer 66 held upon the end of the stud 63 by a nut 67 engages the hub 62 and holds the same upon the stud 63.

In normal operation, the threads *t* pass from between the disks 51 and 53 through the thread guide openings 59 in the shutters 60 and thence through the guides 39 to the needles 17. The tension applied to the threads *t* by the disks 51 and 53 is such as to cause the shutters 60 to be maintained in the position illustrated in full line in Fig. 3. If, however, the thread *t* breaks, as shown at *b* in Fig. 1, the arm 61 is moved by the spring 64 against the stop 65 to bring the shutter 60 to the dotted line position shown in Fig. 3 and into the path of the light beam *a* to intercept the latter. In Fig. 1 the first thread *t* from the left is holding the shutter 60 out of the path of the light beam *a* while the second thread *t*, being broken, has permitted the shutter 60 to move into the path of the light beam *a*. When the light is intercepted the photo-electric cell 92 is deenergized resulting in deenergization of the electro-magnet 95. Consequently, the spring 8 is permitted to move the switch arm 86 out of engagement with the contacts 85 and open the supply circuit to the solenoid 82. This permits the spring 88 to move the clutch element 77 out of engagement with the clutch element 76 and thus disconnect the main drive shaft 30 and the source of power.

The invention eliminates the necessity of having a separate electric circuit or mechanical connection from a detector mechanism associated with each unit of a gang machine since all of the shutters operate on the same beam of light. The arrangement has the additional advantage of permitting the operator to stop the machine suddenly in case of an emergency irrespective of his position merely by thrusting his hand into the light beam which is projected all the way across the machine and is, therefore, accessible from substantially any position.

We claim:

1. In a machine having means operable to connect the machine with a source of power and a plurality of instrumentalities each adapted to perform a predetermined function in the operation of the machine, the combination therewith

of mechanism for actuating said means to connect the machine with the source of power including a light sensitive device and a light source mounted on the machine at points adjacent opposite sides of the series of instrumentalities so that normally the light source may throw a beam of light upon the light sensitive device, a member movable into the path of the beam of light in response to the failure of one of said instrumentalities to perform its predetermined function, and means for rendering said mechanism inoperative when said member is positioned in the path of the beam of light.

2. In a sewing machine having a needle, means for supplying thread to said needle, a tensioning device for applying tension to the thread as it is supplied to said needle, mechanism for actuating the machine, and means for connecting said mechanism with a source of power, the combination therewith of means for actuating said means for connecting said mechanism with a source of power including a light sensitive device and a light source mounted on the machine so the light source may throw a beam of light past said thread upon the light sensitive device, a movable shutter normally urged into the path of said beam, said shutter being arranged to be engaged by said thread and held thereby out of the path of said beam, and means for rendering inoperative said means for connecting said mechanism with a source of power when said shutter is positioned in the path of the beam of light.

3. In a sewing machine having a needle, means for supplying thread to said needle, a tensioning device for applying tension to the thread as it is supplied to said needle, mechanism for actuating the machine, and means for connecting said mechanism with a source of power, the combination therewith of means for actuating said means for connecting said mechanism with a source of power including a light sensitive device and a light source mounted on the machine so the light source may throw a beam of light past said thread

upon the light sensitive device, a movable shutter, a stop adapted to position said shutter in the path of the ray of light, resilient means urging said shutter against said stop, said shutter being arranged to be engaged by said thread and held thereby out of the path of said beam, and means for rendering inoperative said means for connecting said mechanism with a source of power when said shutter is positioned in the path of the beam of light.

4. In a gang machine having a series of working units or instrumentalities, the combination therewith of a light sensitive device, a light source arranged to throw a beam of light upon said light sensitive device, means associated with the several units and controlled thereby for interrupting said beam upon failure of any of said units, and means controlled by said light sensitive device for stopping said machine when said beam is interrupted.

5. In a gang machine having a series of working units or instrumentalities, the combination therewith of a light sensitive device, a light source arranged to throw a normally uninterrupted beam of light across the series upon said light sensitive device, devices associated with each of the units and each controlled by its respective unit for interrupting said beam upon failure of that unit, and means controlled by said light sensitive device for stopping said machine when said beam is interrupted.

6. In a machine having a working instrumentality supplied with a thread or the like, the combination therewith of a light sensitive device, a light source arranged to throw a beam of light upon said light sensitive device, a shutter normally held by said thread out of said beam but adapted upon failure of said thread to interrupt said beam, and means controlled by said light sensitive device for stopping said machine when said beam is interrupted.

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