

Oct. 21, 1958

G. J. ABEL
AUTOMATIC SEWING UNITS

2,856,873

Filed Dec. 7, 1955

2 Sheets-Sheet 1

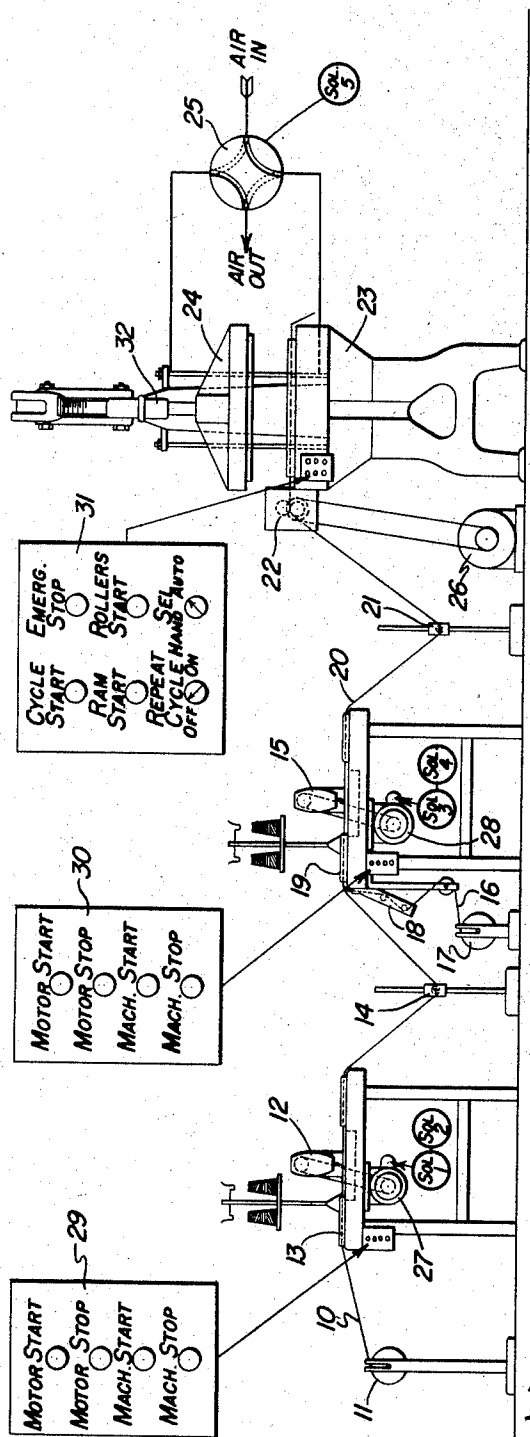


Fig. 1.

INVENTOR.
George J. Abel
BY
Marshall J. Breen
ATTORNEY

Oct. 21, 1958

G. J. ABEL

2,856,873

AUTOMATIC SEWING UNITS

Filed Dec. 7, 1955

2 Sheets-Sheet 2

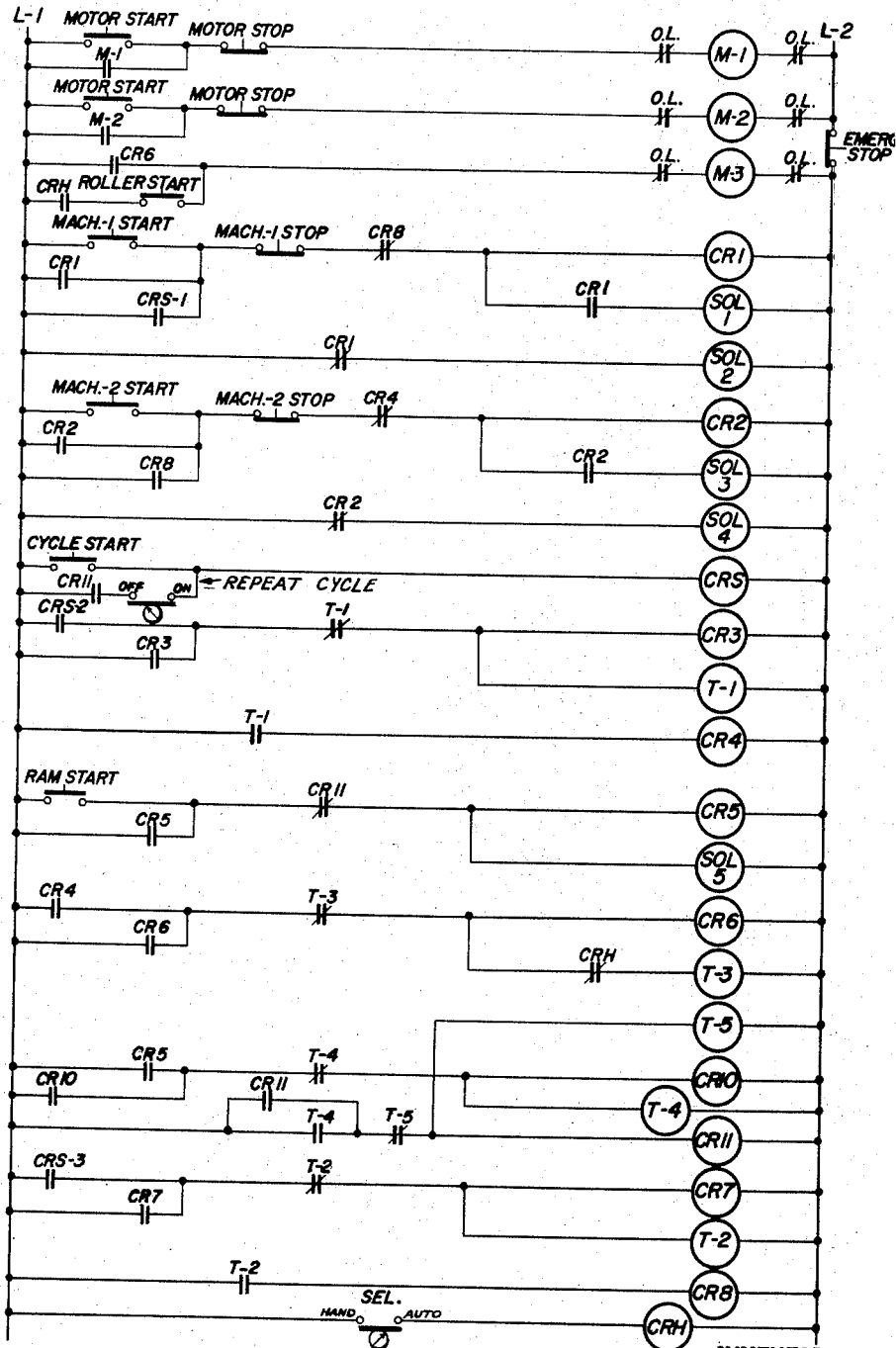


Fig. 2.

George J. Abel

BY

Marshall J. Breen
ATTORNEY

WITNESS

Nicholas L. Szabo

2,856,873

AUTOMATIC SEWING UNITS

George Justin Abel, Watchung, N. J., assignor to The Singer Manufacturing Company, Elizabeth, N. J., a corporation of New Jersey

Application December 7, 1955, Serial No. 551,593

4 Claims. (Cl. 112—155)

This invention relates to coordinated arrangements for, and integrated control of, individual sewing machines with associated apparatus for the automatic fabrication of articles such as work blanks from continuous webs of material.

It is customary in the prior art to employ special machines comprising several sewing machine heads mounted on a common base and all geared together for simultaneous and synchronous operation from one driving source. This is disadvantageous because the very special nature of the composite machine renders it inflexible and unsuitable for easy modification to handle other products.

The approach to the problem according to the present invention has been through the use of an integrated line of individual conventional sewing machines arranged for noncontinuous intermittent operation in a predetermined time sequence cycle controlled by relays, timers and solenoid-actuated electric power transmitters. The operating cycle is manually initiated and automatically terminated. The basic idea is that each machine, in turn, feeds and sews just enough material for one unit product and then stops. The final step in the cycle is the feeding to a blanking press platen of enough sewn material to make a unit product. The operating cycle then stops automatically and the operator must press a button which operates the press ram to cut out a work blank and substantially simultaneously to initiate the next operating cycle to start the first sewing machine.

It is a primary object of this invention to provide separate sewing, cutting and feeding apparatus arranged in an integrated line set-up with a manually-initiated cycle of automatic sequential control using coordinated timers, relays and solenoid-actuated power transmitters, the output per cycle being one work blank.

It is a further object of this invention to provide an automatic cycling sewing unit for making sewn work blanks from continuous webs of material in which the operator merely initiates the cycle for each work blank produced, the cycle being terminated automatically.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations, and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the drawings, Fig. 1 is a diagrammatic view of an integrated line of machines embodying the invention.

Fig. 2 is a diagram of the electrical control system embodying the invention.

Referring to Fig. 1, web material 10 from a supply spool 11 is led to a first sewing machine 12 through a suitable guide 13 where it engages the feed thereof which advances the material under a gravity-biased tension device 14 and presents it to a second sewing machine 15. A second web material 16 from a supply spool 17 is led through suitable tension devices 18 and guides 19 to the

second sewing machine 15 where it is joined by a longitudinal seam to the first web material. The composite web 20 issues from the second sewing machine, passes through a tension device 21 and between feed rollers 22 driven by a motor 26 and is presented to the platen of a blanking press 23 having a reciprocable ram 24. The press 23 is operated by compressed air under the control of a valve 25 operated by a solenoid Sol 5. The first sewing machine 12 is driven by a power transmitter 27 controlled by solenoids Sol 1 and Sol 2. Similarly, the second sewing machine 15 is driven by a power transmitter 28 controlled by solenoids Sol 3 and Sol 4. The solenoid-controlled transmitters 27 and 28 are of the type shown and described in the U. S. patent application Serial No. 536,414, filed September 26, 1955, to which reference may be had for a better understanding of their operation. The solenoid control is so close in reproducing the same running time of the sewing machines in each cycle that the time interval set by the timers is an accurate measure of the length of material sewn.

Push-button stations 29, 30 and 31 are associated with each machine as shown in Fig. 1. The control is such that the first sewing machine 12 starts, draws the web material 10 from the spool 11, hems one edge of a length sufficient for one work blank, passes it on toward the second sewing machine and stops. The second machine 15 then starts and draws both web materials 10 and 16 through its feed, stitches the two pieces together for the same length and stops. The roller feed motor 26 then starts and feeds one length to the blanking press 23 and stops. The operator then pushes the button labeled "Ram Start" at station 31 which operates the press ram 24 and cuts out the work blank which is then removed manually by the operator and is ready for the next operation.

It will be noted from the above that the web material is advanced by only one machine at a time so that there is no need for maintaining any costly synchronous control between machines. It is further to be noted that each cycle is manually initiated and automatically terminated so that the quantity of production is always geared to the operator's working rate, and there is no uncontrolled build up of inventory of unfinished goods.

Operation

The specific control system by which this timed sequence operation is performed will now be explained with reference to Fig. 2. The operator starts the motors of transmitters 27 and 28 by pushing "motor start" buttons at stations 29 and 30 which energize magnetic starters M-1 and M-2 in the usual way. Next the "cycle start" button at station 31 is pushed which energizes relay CRS momentarily to energize relay CR3 and timer T-1 which are locked in through the normally-closed contacts of the timer T-1. Relay CR1 is energized and locked in through the normally-closed contacts of relay CR8. Pick-up of CR1 releases solenoid Sol 2 and picks up solenoid Sol 1 to engage the clutch of transmitter 27 to start the sewing machine 12.

Relay CR7 and timer T-2 are energized and locked in through normally-closed contacts of the timer T-2. At the expiration of the period for which timer T-2 is set the normally-open contacts of T-2 close and energize relay CR8 whose contacts open to deenergize relay CR1 and release solenoid Sol 1 and to energize solenoid Sol 2, thus braking the sewing machine 12 to a stop. At the same time the normally-open contacts of relay CR8 close to energize CR2 which is locked in through normally-closed contacts of relay CR4. This energizes the solenoid Sol 3 and deenergizes the solenoid Sol 4 to engage the clutch of transmitter 28 to start the second sewing machine 15.

At the expiration of the time for which timer T-1 is set, the normally-open contacts of T-1 close to energize relay CR4 whose contacts open to deenergize relay CR2 and release solenoid Sol 3 and to energize solenoid Sol 4 thus braking the sewing machine 15 to a stop. Closure of normally-open contacts of relay CR4 energizes relay CR6 and timer T-3 which are locked in through normally-closed contacts of the timer T-3. Closure of contacts of relay CR6 energizes the magnetic starter M-3 for the feed roll motor 26 which starts and feeds material from the sewing machines to the press 23.

At the expiration of the time for which the timer T-3 is set the normally-closed contacts of T-3 are opened and relay CR6 is deenergized. This also deenergizes the timer T-3 allowing it to return to normal. Opening of the contacts of CR6 deenergizes the feed roll motor starter M-3 thus stopping the feed roll motor 26 and this completes the cycle. This operation is repeated with the "cycle start" button a few times in order to provide enough stitched material to pass completely under the ram 24 of the blanking press 23. When this is accomplished, further operation is started automatically by pressing the "ram start" button at station 31 to initiate cutting out the blank, provided the "repeat cycle" switch is placed in the "on" position.

Operation of the "ram start" button energizes relay CR5 and solenoid Sol 5 and locks them in through normally-closed contacts of relay CR11. Solenoid Sol 5 operates a 4-way valve 25 admitting air to the ram cylinder 32 of the press 23 to operate the cutting stroke. Normally-open contacts of CR5 close to energize relay CR10 and timer T-4 which are locked in through the normally-closed contacts of the timer T-4.

At the expiration of the time for which the timer T-4 is set, normally-open contacts of T-4 close to energize CR11 temporarily, thus opening the normally-closed contacts of CR11 to deenergize CR5 and solenoid Sol 5 to operate valve 25 to raise the press ram 24. Energization of relay CR11 closes normally-open contacts of CR11 to energize relay CRS and the cycle is restarted just as though the "cycle start" button were pressed and the cycle again proceeds as described above.

If it is desired to manually operate the roll drive motor independently of the automatic cycling, the Hand-Automatic Switch is placed in "Hand" position. This energizes relay CRH closing its normally-open contacts. Closure of the "roller start" button will then energize the magnetic starter M-3 and the feed roll motor 26 will run so long as this button is depressed.

It will be seen from the above that I have provided an integrated assembly line of sewing, feeding and cutting machines, each with its own driving unit, and coordinated controls therefor which start and stop each machine in a predetermined manually-initiated and automatically-terminated time sequential cycle whereby each machine, in turn, handles just enough material to make a unit work blank, thus making unnecessary any synchronous tie between the machines.

Because of the loops of the web material formed between the machines and because the timers may be set very closely to duplicate the length of material fed by each machine, this system requires very little resetting and then only at infrequent intervals.

The flexibility of this arrangement is clearly reflected in the ease with which the individual machines may be rearranged for a new space relation and the timers reset for a new time relation, should the situation demand it.

This invention has been described with reference to the specific machine operations of hemming and joining two webs of material using two sewing machines but it is not to be construed as so limited. It is to be understood, therefore, that any known operations involving any number of sewing machines can be used in the system disclosed and the invention includes within its scope such arrangements as come within the definitions set forth in the appended claims.

Having thus set forth the nature of the invention, what I claim herein is:

1. Apparatus for making work blanks having pieces joined by stitching, comprising a plurality of separate sewing machines arranged in tandem for stitching and joining continuous webs of material to form a composite web, a solenoid-operated power transmitter associated with each machine, control means comprising relays and timers for actuating the transmitter solenoids to start and stop each sewing machine in a predetermined time sequential cycle and for establishing a running time for each machine just sufficient to feed enough material length for a predetermined work blank, a blanking press for receiving the composite web from the sewing machines, and manual means for initiating substantially simultaneously a single blanking operation of the press and a single cycle of sequential operations of the sewing machines.

2. An automatic cycling sewing unit comprising a plurality of separate sewing and feeding devices arranged in tandem for stitching and joining continuous webs of material to form a composite web, individual power means for driving each device, solenoid means for actuating the power means, control means, including relays and timers, for actuating the solenoid means to start and stop each device in a predetermined time sequence cycle and to establish a predetermined running time for each device just sufficient to feed a predetermined length of material, a blanking press for receiving the predetermined length of the composite web from the sewing and feeding devices, and manual means for initiating a single blanking stroke of the press and a single cycle of sequential operations of the sewing and feeding devices.

3. Apparatus for making work blanks having pieces joined by stitching comprising a plurality of separate sewing, cutting and feeding devices arranged in tandem for stitching, joining and cutting continuous webs of material, solenoids for establishing an operating cycle for said devices, and unitary control means including relays and timers for actuating the solenoids for starting and stopping each device in turn to establish sequential running times for each device so that each device feeds substantially the same length of said material in each cycle.

4. An automatic cycling sewing unit comprising an integrated, in-line space arrangement of separate sewing, cutting and feeding devices for stitching, joining and cutting continuous webs of material, separate driving means for each of said devices, solenoids for actuating said driving means, control means for energizing the solenoids in a predetermined order and for a predetermined time for starting and stopping each device in a time sequential cycle, manual means for starting the cycle and automatic means for stopping it.

References Cited in the file of this patent

UNITED STATES PATENTS

2,362,462	Belcher et al. _____	Nov. 14, 1944
2,712,292	Kindseth _____	July 5, 1955