Oct. 26, 1965 R. J. BOSER 3,213,814

GANGED SEWING MACHINES

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FIG. 2

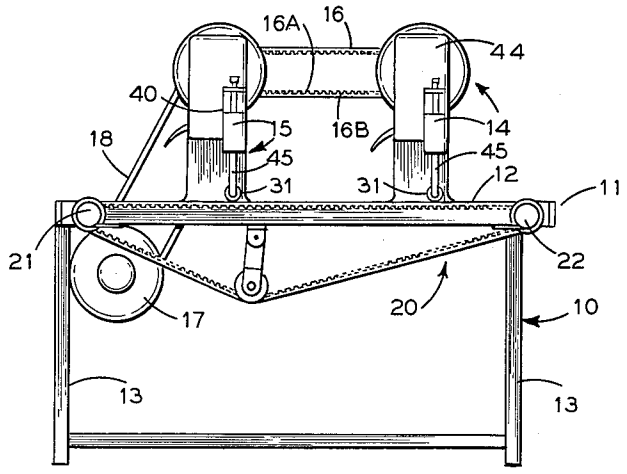


FIG. 1

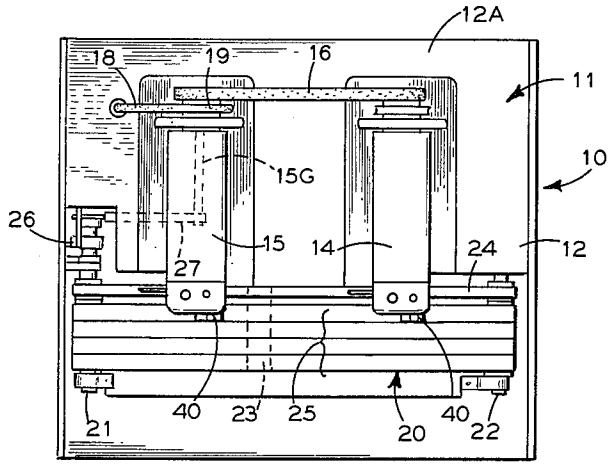
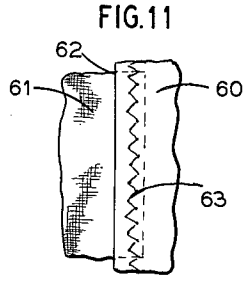


FIG. 11



INVENTOR.
Ronald J. Boser

BY Irving Seidman
ATTORNEY

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GANGED SEWING MACHINES

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FIG. 3

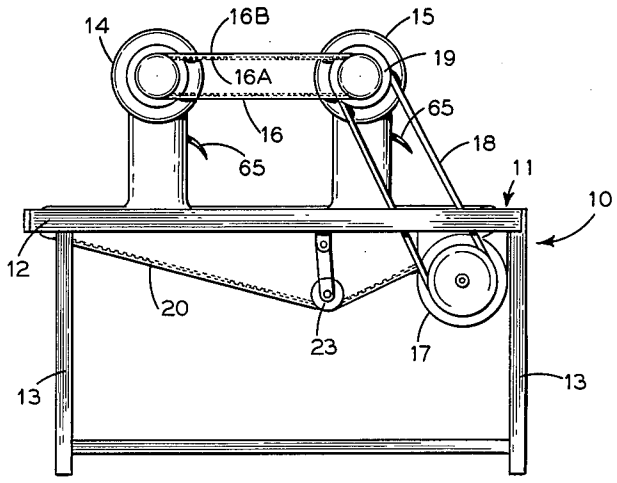
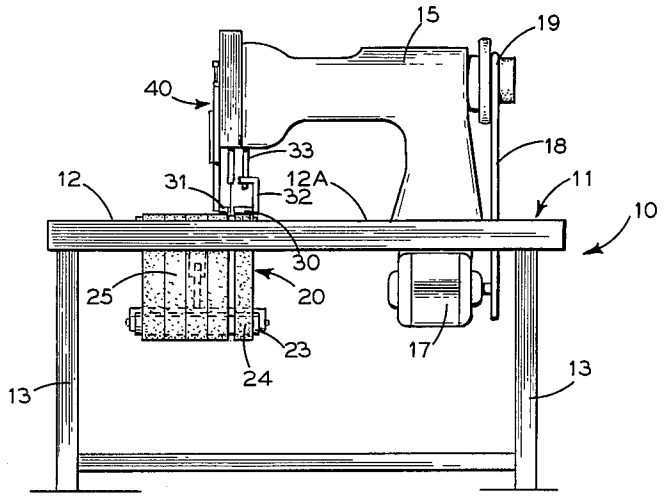


FIG. 4



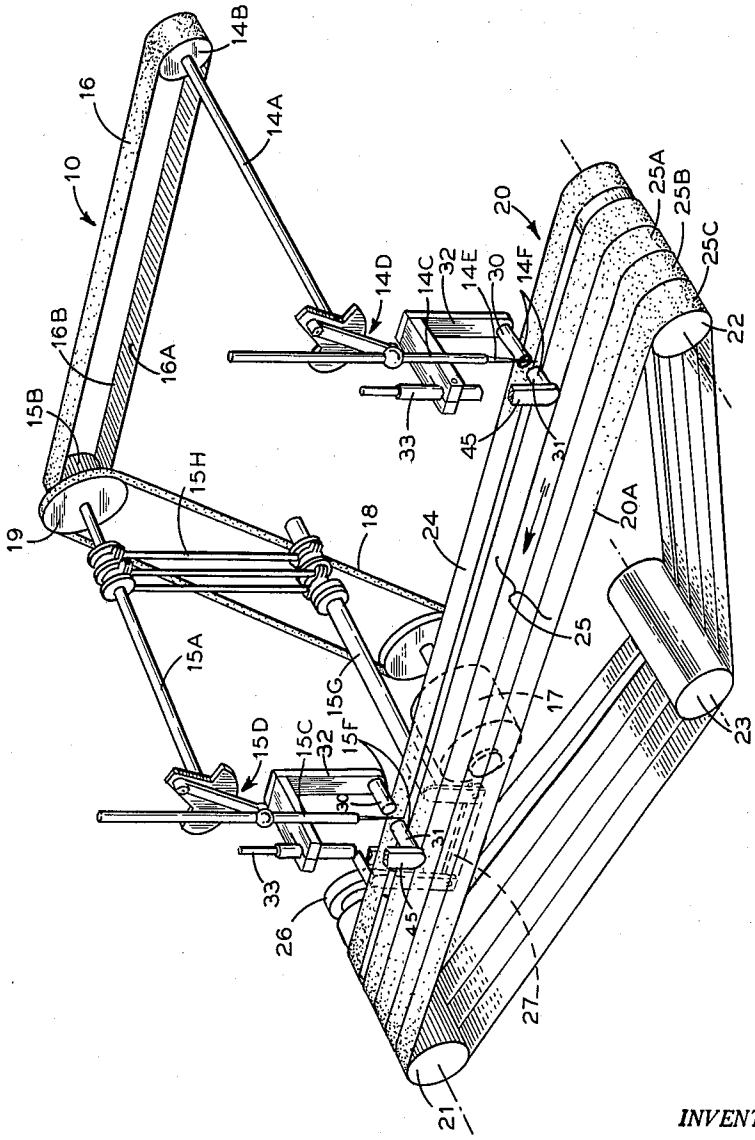
INVENTOR.
Ronald J. Boser
BY Irving Deidman
ATTORNEY

Oct. 26, 1965 R. J. BOSER 3,213,814

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FIG. 5



INVENTOR.
Ronald J. Boser
BY Irving Seidman
ATTORNEY

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GANGED SEWING MACHINES

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FIG. 7

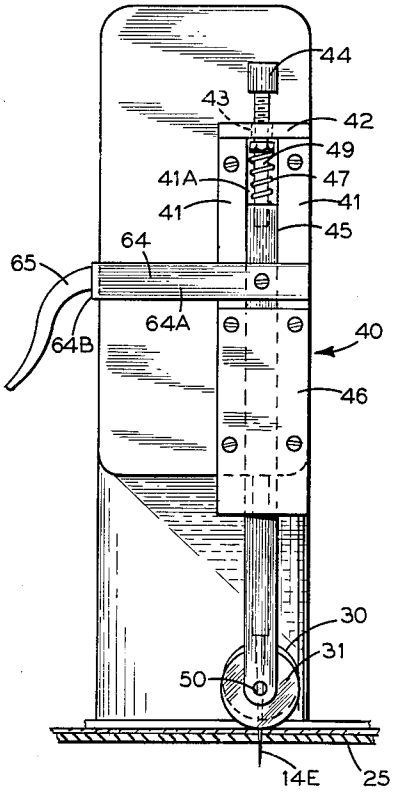


FIG. 6

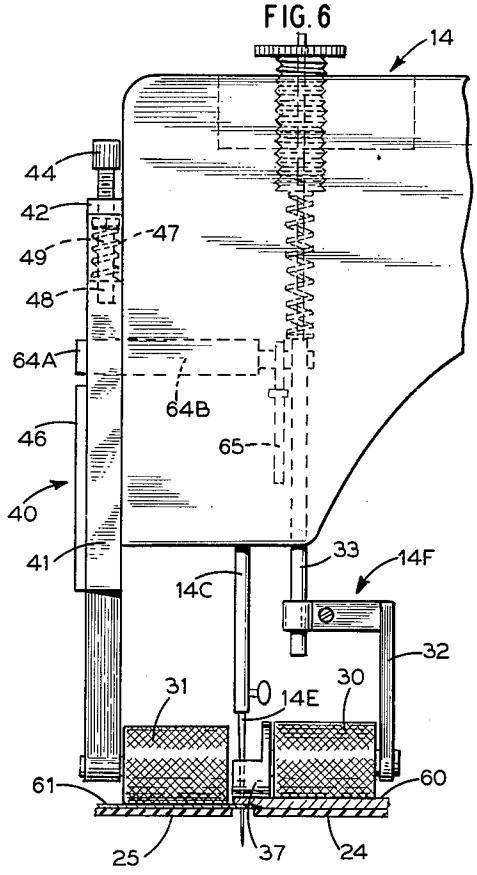


FIG. 9



FIG. 8

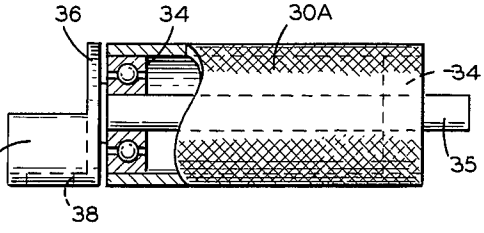
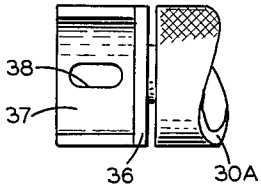


FIG. 10



INVENTOR.
Ronald J. Boser

BY
Irving Heidman
ATTORNEY

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GANGED SEWING MACHINES

Ronald J. Boser, Huntington, N.Y., assignor to B. & W. Mfg. Co., Inc., New York, N.Y.

Filed Apr. 25, 1962, Ser. No. 190,165
3 Claims. (Cl. 112—155)

This invention relates in general to the sewing machine art, and more specifically to ganged sewing machines, and improved feed means for feeding a work piece to the sewing station of the respective machines.

Heretofore, efforts have been made to gang several sewing machines, so that each would successively perform its respective sewing operation on a given work piece, under the operation of a single operator. However, all prior known attempts to gang several sewing machines to simultaneously perform successive and distinct sewing operations under the control of a single operator have not proven practical.

In gang sewing for simultaneously and successively performing several distinct sewing operations, it is essential that each of the sewing machines be placed in synchronization so that the work piece may be properly guided and advanced at the same rate by the sewing needles of the respective machines. Synchronization of such ganged sewing machines heretofore has proven to be extremely difficult because the feeding mechanisms of the respective sewing machines were maintained separate and distinct. For this reason, feeding of the work piece to the respective sewing machine was not uniform. Consequently, there is not now known a practical means for synchronizing the operation of several ganged machines for simultaneously and successively performing distinct sewing operations to produce a satisfactory seam.

Also with feed mechanisms now employed in sewing machines, extreme difficulties have been encountered in feeding, for example two work pieces of relative thicknesses, which are required to be sewn together, under the sewing needle of a sewing machine. For example, in the making of ladies' undergarments and the like, it is essential that a relatively thick binding be oftentimes sewn to the edge of lace, mesh, or other relatively smooth or thin material. In such instances the feeding of two pieces having a relative thickness seldom can be uniform with known feed dog arrangements. Thus constant attention on the part of an operator is required to assure that the two pieces are properly fed under the sewing needles. Further, the operator must constantly guide two such pieces to insure the formation of a uniform seam. Also it has been observed that when seams of non-uniform thickness, e.g. when a portion of a seam is required to be folded over onto itself so that the thickness of the piece at the point of sewing is substantially increased, results in a binding or a slowing down in the feed rate of the thickened portion of the seam. As a result, such binding or uneven feeding of two materials of relative thicknesses, further complicated the problem of ganging sewing machines together.

Also with the conventional feed mechanisms of known sewing machines, some difficulty has been encountered when elastic materials are being sewn to each other or to a non-elastic material. Because of the conventional feed means wherein a presser foot maintains a force on the elastic material in the sewing station as the feed dog, within its four-way feeding action, intermittently advances the elastic work piece, there is an inherent tendency of the feed dog to induce a stretch in the elastic material during the sewing operation. As a result, the elastic material is sewn to the other piece in a partly extended or stretched condition. Thus, in a finished seam the elastic material is partially stretched. As a result, the elasticity of the elastic material is adversely affected.

Therefore, an object of this invention is to provide a ganged sewing machine in which a plurality of separate and distinct sewing machines are operatively connected so that the sewing operation of the respective machines are perfectly synchronized.

Another object is to provide in a ganged sewing machine a novel feeding mechanism which is common to each of the sewing machines in a given gang and which feeding mechanism is connected in direct driving relationship with only one machine of the gang.

Another object is to provide a novel feed mechanism constructed and arranged so as to be common to each of the sewing means in the gang and operative so as to be synchronized with the sewing needles of the respective machines.

Another object is to provide in a ganged sewing machine a novel means for synchronizing the sewing operation of the respective machines in a relatively simple, inexpensive and positive manner.

Another object is to provide a novel means for ganging conventional sewing machines without necessitating any major alteration or modification of the respective sewing machines.

Still another object is to provide for the uniform feeding of a plurality of work pieces having relative thicknesses and which are to be sewn together at a substantially uniform rate to a sewing station of a sewing machine.

In accordance with this invention the foregoing objects, and other features and advantages are attained by the arrangement of two or more sewing machines disposed in tandem on a suitable support or table and connected in driving relationship with one another by a suitable drive means. A power means is connected in driving relationship to one of the machines. Preferably the power means is connected in driving relationship to the last in line machine by a belt drive. Thus, upon actuation of the power means under the control of a single operator, the operation of each machine in the gang will be affected. To synchronize the sewing operation of the respective machines, and to facilitate the feeding of the work pieces which are to be sewn together, successively to each of the sewing machines, a novel feeding means is provided. In accordance with this invention, an endless conveyor means is arranged so that one of its flights passes under the presser feet of the respective sewing machines. Accordingly, the endless conveyor passes over suitable rollers, one of which is connected in driving relation to the feed operator of one of the sewing machines.

In accordance with this invention a unidirectional, double throw clutch is operatively connected between the driving roller of the conveyor means and the feed operator of the driving sewing machine. In operation, the movement of the conveyor is such that the intermittent advance or feed of the conveyor means relative to each machine is the same, the operation of the conveyor means being timed to the operation of the needle of the respective machines. Thus, in effect, the conveyor serves as a common feed dog for each of the machines in the gang.

Operatively associated with the conveyor means at the sewing station of the respective sewing means are pressure roller means which cooperate with the conveyor to feed the work piece to be joined under the sewing needles of the respective sewing machine. In accordance with this invention, a pair of pressure rollers, one being disposed on opposite sides of the needle at the sewing station of the respective machine are provided. Each of the rollers are separate and distinct and each is independently biased toward the conveyor so as to be disposed in rolling engagement therewith. Thus in the feeding of the work piece to the respective needles, the work pieces to be joined are progressively advanced by the cooperative effect of the conveyor and cooperating pres-

sure rollers. Because each of the pressure rollers are independently biased toward the conveyor, work pieces of relative thickness may be uniformly advanced between their particular pressure roller and conveyor means with equal facility and each, therefore, advances at the same rate, regardless of their thickness. Further, the co-action of the pressure rollers and the conveyor is such that the feeding of an elastic binding material past the respective needles may be accomplished without inducing a stretch in the elastic work piece. Thus the elastic work piece may be sewn to a complementary piece in its completely distended condition.

A feature of this invention resides in the arrangement of an endless conveyor having one of its flights common to each of the sewing machines in the gang, and which conveyor is operatively connected to a unidirectional clutch means operatively connected in driving relationship to feed mechanism of one of the machines in the gang.

Another feature of the invention resides in the provision that the endless conveyor facilitates the feeding of successive work pieces to each of the respective machines in a continuous assembly line manner so as to require a minimum of handling.

Another feature resides in the provision that only minimum machine modification or alteration is required to accommodate a conventional sewing machine to the gang sewing arrangement in accordance with this invention.

Another feature resides in the provision of an improved means for feeding a plurality of work pieces, required to be sewn together, to the sewing station of a sewing means.

A specific feature of this invention resides in the provision of an endless conveyor means and cooperating pressure rollers for advancing therebetween the work pieces to the sewing station of a sewing machine.

Still another feature of the invention resides in the provision of a pair of pressure rollers, one disposed in line on either side of the sewing needles, and each cooperating with an endless conveyor for feeding a work piece to the sewing needle, wherein each of the pressure rollers are independently biased in rolling engagement with the conveyor and work piece transported thereby.

Other features and advantages will become more readily apparent when considered in view of the drawings and specification, in which:

FIG. 1 is a plan view of the gang sewing machine of this invention;

FIG. 2 is an end view of the machine of FIG. 1;

FIG. 3 is the other end view of the machine of FIG. 1;

FIG. 4 is a front elevational view of the machine of FIG. 1;

FIG. 5 is a diagrammatical perspective view of the essential features of the gang sewing machine of this invention;

FIG. 6 is an enlarged fragmentary front elevation of one of the ganged sewing machines illustrating the cooperating pressure rollers of the instant invention;

FIG. 7 is an end view of FIG. 6;

FIG. 8 is an enlarged detail of one of the pressure rollers per se; having portions thereof broken away;

FIG. 9 is the left end view of FIG. 8;

FIG. 10 is a fragmentary plan view of FIG. 8; and

FIG. 11 illustrates a work piece formed of two pieces of material having relative thicknesses.

Referring to the drawings, there is shown in accordance with this invention an improved ganged sewing machine **10**. The machine **10** in essence comprises a suitable frame or support **11** having a top **12** supported on a plurality of leg supports **13**. Supported on the platform portion **12A** of the top **12** are a plurality of sewing machines **14, 15**. In the illustrated embodiment the sewing machines are disposed in tandem. It will be understood that any reasonable number of sewing machines may be mounted in tandem on the table top **12**. However, for the purpose of illustration and description the showing of only two such sewing machines **14, 15** will suffice.

Each of the sewing machines **14, 15**, it will be understood, may be of any well known construction e.g. a Singer type sewing machine or the like. Each of the sewing machines **14, 15** is of conventional construction, except as herein modified. Generally, each sewing machine **14, 15** includes a main drive shaft **14A, 15A**, a head pulley **14B, 15B** connected with their respective drive shafts, a needle bar **14C, 15C** connected to their respective drive shafts by the usual crank and pitman **14D, 15D**, and a needle **14E, 15E** carried by the respective needle bars. Operatively associated with each of the needles are pressure rollers **14F, 13F**, to be herein described. A feed dog operator **15G**, operatively connected to the main drive shaft **15A** of machine **15**, serves to effect the driving of the novel feed means, as will be hereinafter described.

In accordance with this invention each of the sewing machines **14, 15** are connected in driving relationship to one another. This is attained by a drive belt **16** passing over appropriate pulleys **14B, 15B** which are connected to the drive shafts **14A, 15A** of the respective machines. To prevent slippage a timing belt **16** formed with a series of transversely extending lands **16A** and grooves **16B** is preferred. Accordingly, the lands **16A** and grooves **16B** mesh with complementary lands and grooves formed on pulleys **14B, 15B**. Thus positive non-slip drive is assured.

Means for driving the sewing machines thus coupled in driving relationship, as above described, includes a suitable motor **17** which is connected by a belt drive **18** to a second pulley **19** connected to the drive shaft of one of the sewing machines. In the illustrated embodiment the motor **17** is connected in driving relationship with the last in line machine **15**.

In order that the sewing machines **14, 15** may be operated so that each may successively and simultaneously perform a sewing operation on a given work piece, a novel conveyor means **20**, common to each of the machines **14, 15** is provided. As shown in the drawing, the conveyor means comprises an endless conveyor **20** threaded over a driving roller **21** at one end and over a driven roller **22** at the other end thereof. Interposed between the driving roller **21** and driven rollers **22** is a tension roller **23**. In accordance with this invention, it will be noted that the conveyor **20** is disposed so that one of its flights **20A** passes under the presser feet **14F, 15F** of each machine.

In order to provide space for the sewing needle or needles **14E, 15E**, the conveyor **20** is formed in at least two sections **24** and **25**. One section **24** is disposed on one side of the needles and the other section **25** of the conveyor **20** is disposed on the other side of the sewing needle **14E, 15E**, in spaced relationship to the conveyor section **24**. Normally, the outer portion **25** of the conveyor is formed of greater width than the inner portion **24**. As shown in FIG. 5, the outer portion **25** may be formed in several parts **25A, 25B, 25C**, of relatively narrow widths. However, a single width belt may be used in lieu of the narrow widths **25A, 25B** and **25C**.

In the illustrated embodiment, the outer portion **25** of the conveyor **20** is formed of several parts, thus the width of the outer portion of the conveyor may be readily adjusted to any given width. Each portion of the conveyor **24, 25** is formed of a flexible timing belt meshing with the cooperating drive and driven rollers **21, 22**.

In accordance with this invention means are provided for driving the drive roller **21** of the conveyor means **20** so that the work pieces may be properly fed under the needles of the respective machines. This means includes a unidirectional, double throw, clutch **26** operatively connected in driving relationship to the drive roller **21** of the conveyor means **20**. The clutch **26** is provided with an overriding feature to prevent backlash, such

clutch means being a well known article of commerce, and therefore, a description thereof is not required for an understanding of the invention.

In accordance with this invention the clutch 26 is operatively connected to the feed dog operator of one of the sewing machines by a suitable linkage assembly 27. In the illustrated embodiment the clutch 26 is operatively connected to the feed dog operator 15G of the last in line machine 15.

As shown in FIG. 5, the feed dog operator 15G is connected to the drive shaft 15A of the machine 15 by a suitable connecting link 15H which will transform the rotary motion of the drive shaft 15A to an oscillating of the feed dog operator 15G, and the oscillating movement of the feed dog 15G in turn is transmitted through linkage assembly 27 to the clutch 26 to effect an intermittent unidirectional drive of the drive roller 21, and consequently intermittent advance of the associated conveyor sections 24, 25.

Thus it will be apparent that the conveyor 20 as described will, in effect, function as a common feed dog for each of the machines so that the work piece carried thereon can be properly fed to each of the machines.

Connected to each of the sewing machines 14, 15 are cooperating pressure roller means 14F, 15F operatively associated with the conveyor means 20 for feeding the material or work pieces to be sewn therebetween.

The pressure roller means 14F and 15F of the respective machines are similar in construction, and therefore the description of one will suffice for an understanding of their structure and function.

Referring to FIGS. 6 to 10, the pressure roller means 14F comprises a pair of pressure rollers 30 and 31, each of which is individually mounted and disposed on opposite sides of the needle 14E. As shown roller 30 is rotatably mounted on a bracket 32 which is secured to the presser foot bar 33 of sewing machine 14. The roller 30 comprises a cylinder sleeve 30A having a knurled outer surface, and which sleeve is rotatably journaled by means of bearing races 34 on an axle 35 fixed to bracket 32. Thus it will be apparent that the pressure foot bar 33 will urge the pressure roller 30 toward the conveyor belt portion 24 in the operative position thereof.

Fixed to the free end of axle 35 is a hub 36 which has connected thereto an arcuate flange segment 37. At the bottom of the flange segment there is provided an elongated slot 38 through which the needle 14E passes during the sewing operation. As shown in FIG. 6, the width of the flange segment 37 is equal to substantially the distance between conveyor portions 24, 25. Thus, the flange segments 37 serve as the presser foot.

The other pressure roller 31 is mounted to a bracket assembly 40 fixed to the end of the machine 14. As shown the bracket assembly 40 comprises a pair of spaced guide bars 41 defining a guideway 41A which is closed at the upper end by a cross plate 42, the latter being provided with a tapped hole 43 for receiving an adjusting screw 44.

Between the guide bars 41 is a slide bar 45, which is free to slide in the guide way 41A, and a cover plate 46 serves to maintain the slide bar within the guide way 41A.

As shown the slide bar 45 is urged toward the conveyor portion 24 by a spring 47 positioned between the top of the slide bar 45 and the cross plate 42. To maintain the spring 47 in position, the top of the slide bar 45 is provided with a bore 48 to define a seat for the spring 47. A guide pin 49 extends into the convolution of the coil spring 47, pin 49 having a head which is spaced from cross plate 42. As shown, spring 47 urges the pin 49 into engagement with the end of the adjusting screw 44. Thus by a turn of the adjusting screw 44 the load on the spring 47 can be varied accordingly.

Connected to the lower end of the slide bar 45 is pressure roller 31. Pressure roller 31 comprises a knurled sleeve rotatably journaled to axle 50, in a manner similar to that hereinbefore described with reference to roller 30. Each of the rollers 30, 31 are thus independently biased toward the conveyor means. Also, it is to be noted that the tangent point of the respective rollers, i.e. the point or line about which the respective pressure rollers 30, 31 rotate, are disposed in a line coincident with the needle.

The arrangement is such that during a sewing operation the work pieces, 60, 61 (FIG. 11) which are to be sewn together are fed under the respective needles 14E, 15E by passing between the conveyor means 20, and the pressure rollers 30, 31 disposed in free rolling engagement therewith. Thus the rollers 30, 31 which are individually biased toward their respective conveyor portions 24, 25 maintain the tension necessary to feed the material or work pieces 60, 61 during a sewing operation.

With the construction described, two work pieces of relative thickness can be readily fed at the same rate, and thereby can be properly sewn to result in a smooth and uniform seam 63. For example, as shown in FIG. 11, a relatively thick binding 61 can be sewn to a relatively thin, lacey type material 62 with a smooth uniform seam 63. Because the respective rollers 30, 31 are individually biased toward the conveyor means, each work piece may be advanced at the same rate. Further binding of the work piece because of any abnormal thickness in passing under the sewing needle is for all practical purposes eliminated. Thus, folding attachments or other attachments may be interposed between the sewing stations of the respective machines, so that each machine may successively nad simultaneously perform a separate and distinct operation of several operations which may be required to form a finished garment, all under the attention of but a single operator.

In some instances, depending on the thickness of the materials or work pieces to be sewn, it may be desirable to provide a presser foot which is not integrally formed with one of the rollers, as for example roller 30, as hereinbefore described. In such instances, the separate presser foot may be mounted on the presser foot bar 33 of the machine as is generally conventional with standard machines. In such cases, the roller 30 may be independently mounted on a bracket assembly similar in construction to the bracket assembly 40, mounting roller 31 as hereinbefore described. With this arrangement it will be noted that both rollers, and the distinct presser foot disposed therebetween are thus independently spring loaded.

If desired, means are provided to simultaneously lift the respective rollers off the conveyors as the presser foot is raised. As shown in FIGS. 6 and 7 an L-shaped bracket 64 having leg 64A thereof fixed to the slide bar 45 and having the other leg 64B thereof extending along the back of the machine. Leg 64B is suitably coupled to the presser foot bar 33, and a camming lever 65 is operatively associated with the foot bar 33 in a manner well known, so that movement of the lever in one direction will cam the presser foot bar 33 and roller 30, and the silde bar 45 with connected roller 31 upwardly against the bias of their respective spring biasing means. If desired, lever 65 may be operatively connected with a knee actuator through the interconnection thereof by suitable linkage arrangement, as is well known, so that an operator may lift the rollers 30, 31 and the associated presser foot without the use of hands.

With the construction described a single operator may simultaneously perform two or more sewing operations on a work piece. The described arrangement is susceptible of performing most any sewing operation that a single machine may do. Each of the sewing machines may have one or more needles for forming either single seam sewing or multiple seam sewing or any combination therof. If desired, suitable attachements may be interposed between machines for folding the work piece or for otherwise automatically preparing or positioning it for performing the next successive sewing operation by the

machine next in line. Also, the conveyor associated with the multiple sewing machine arrangement herein described minimizes handlings, since the work pieces may be deposited automatically in a suitable bin or collector disposed at the end of the conveyor. Thus, in a mass production operation, actual count of an operator's work can be readily ascertained with a minimum of handling.

Further, the cooperating feed rollers greatly enhance the feeding of the work pieces with a maximum of ease. When two or more work pieces are to be sewn together, each may be fed by the co-action between the conveyor portions **24**, **25** and their associated pressure rollers **30**, **31**. The individually biased pressure rollers permit uniform feeding of material work pieces of varying thicknesses. Also, the pressure rollers permit the feeding of elastic material without inducing any stretch therein during a sewing operation. In essence, the ganged machine arrangement and the improved feeding means therefor is relatively simple in structure, relatively easy to assemble and position in operation.

While the instant invention has been disclosed with reference to a particular embodiment, it is to be appreciated that the invention is not to be taken as limited to all of the details thereof as modifications and variations thereof may be made without departing from the spirit or scope of the invention.

What is claimed is:

1. A machine for simultaneously performing a series of successive sewing operations on a work piece comprising a frame, at least a pair of sewing machines mounted on said frame one behind the other, each of said sewing machines including a main driving shaft, an operatively connected needle bar, a means operatively connecting said driving shaft to the needle bar, a pair of pressure roller means, a motor means connected in driving relationship to one of said machines, means connecting said other machine in timed driving relationship to said motor driven machine whereby the needles of the respective machines reciprocate in unison, an endless conveyor having spaced flights, one of said flights passing beneath the pair of pressure roller means of each sewing machine, means for individually biasing each of the respective pair of roller means relative to said flight passing therebeneath, and means for adjusting the bias on each of said roller means, said conveyor having portions disposed on either side of the needles of said sewing machines, means for synchronizing the movement of said conveyor portions with the sewing needle of each of said machines, said synchronizing means including a drive roller for driving said conveyor, unidirectional drive means operatively connected with said drive roller whereby said conveyor is intermittently advanced, and means operatively connecting said unidirectional drive means to said main drive shaft of said motor driven machine, whereby said conveyor functions as a common feed dog for each of said machines to effect synchronization of the sewing operation of the respective machines.

2. In combination, a pair of sewing machines each having a sewing needle and means for reciprocating said needle wherein the respective needles of said machines are simultaneously reciprocated in timed relationship, feed means for feeding two work pieces adapted to be sewn together under said needle, said feed means comprising an endless conveyor, said conveyor including a pair of endless belts, each belt being positioned on opposite sides of the respective needles of said machines in spaced relationship, a pair of pressure rollers mounted on each of said machines, one each of said pair of pressure rollers being operatively associated with one of said endless belts, means for individually biasing each of said pressure rollers into driving relationship with its associated belt, and means for intermittently advancing each of said belts in synchronization with the operation of said sewing needles whereby the co-action of said conveyor belt position and associated pressure rollers feed therebetween the work piece past said sewing needle.

3. A machine for simultaneously performing a series of successive sewing operations on a work piece comprising a frame, at least a pair of sewing machines mounted on said frame one behind the other, each of said sewing machines including a main driving shaft, a needle bar operatively connected to said driving shaft, a motor means connected in driving relationship to one of said machines, means connecting said other machine in timed driving relationship to said motor driven machine whereby the needles of the respective machines reciprocate in unison, an endless conveyor having spaced flights, one of said flights passing the sewing station of each sewing machine, said conveyor having a portion thereof disposed on either side of the needles of said sewing machines, means synchronizing the movement of said conveyor with the sewing of each of said machines, said synchronizing means including a drive roller and a driven roller for driving said conveyor, a unidirectional clutch means operatively connected with said drive roller whereby said conveyor is intermittently advanced, and means operatively connecting said unidirectional clutch means to said main drive shaft, a pressure roller means including a pair of rollers, each of said pair of rollers being disposed on opposite sides of the needle of each machine, means for individually mounting and biasing each of said pressure rollers into driving relationship with said conveyor where the co-action of said conveyor and feed rollers feed the work piece under the sewing needles, said mounting and biasing means including a bracket adapted to be connected to the end of each sewing machine adjacent the sewing needle thereof, each of said brackets including a pair of spaced guide bars to define therebetween a guide way, a cross-bar connected across the top of said guide bars, said cross bar having a tapped hole therein, a slide bar disposed between said guide bars, one of said pair of pressure rollers rotatably journaled to the lower end of said slide bar, a spring disposed between the upper end of said slide bar and said cross bar, and a load adjusting screw threaded through said tapped hole of said cross bar to engage said spring so that adjustment of said screw varies the load of said spring on said slide bar.

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ROBERT V. SLOAN, *Primary Examiner.*

DAVID J. WILLIAMOWSKY, JORDAN FRANKLIN, *Examiners.*