June 18, 1957 W. M. LASKER 2,795,785

NET MANUFACTURING MACHINE

Filed Feb. 8, 1955 5 Sheets-Sheet 1

FIG 1.

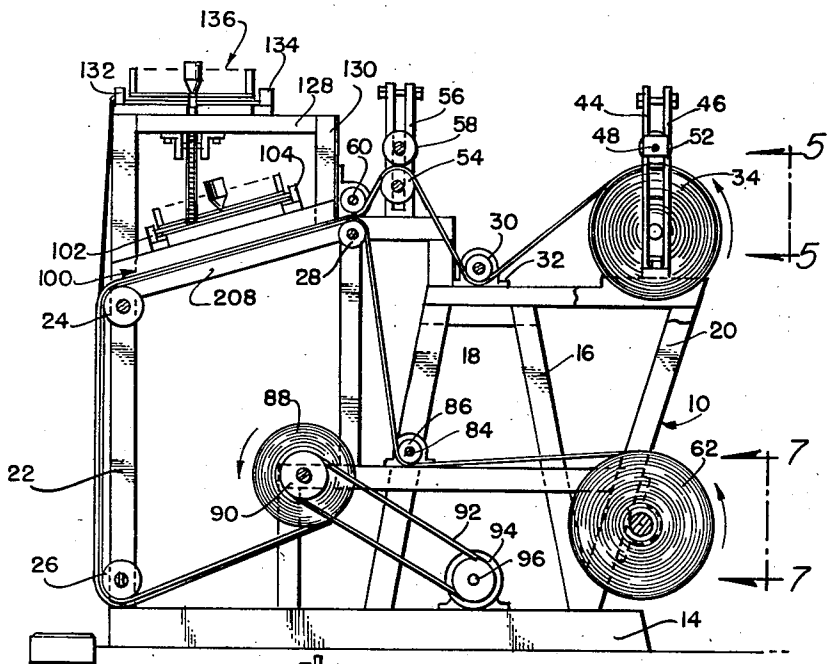
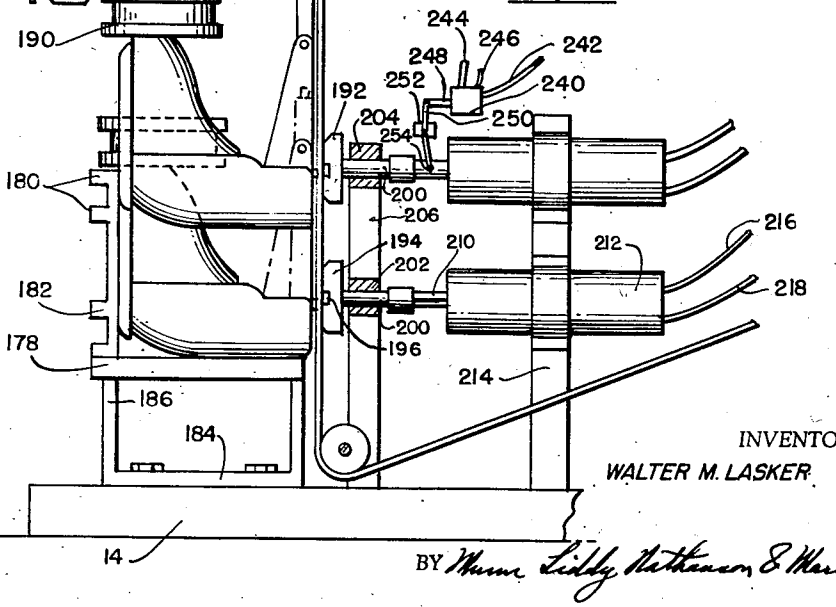


FIG. 4.



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June 18, 1957 W. M. LASKER 2,795,785

NET MANUFACTURING MACHINE

Filed Feb. 8, 1955 5 Sheets-Sheet 2

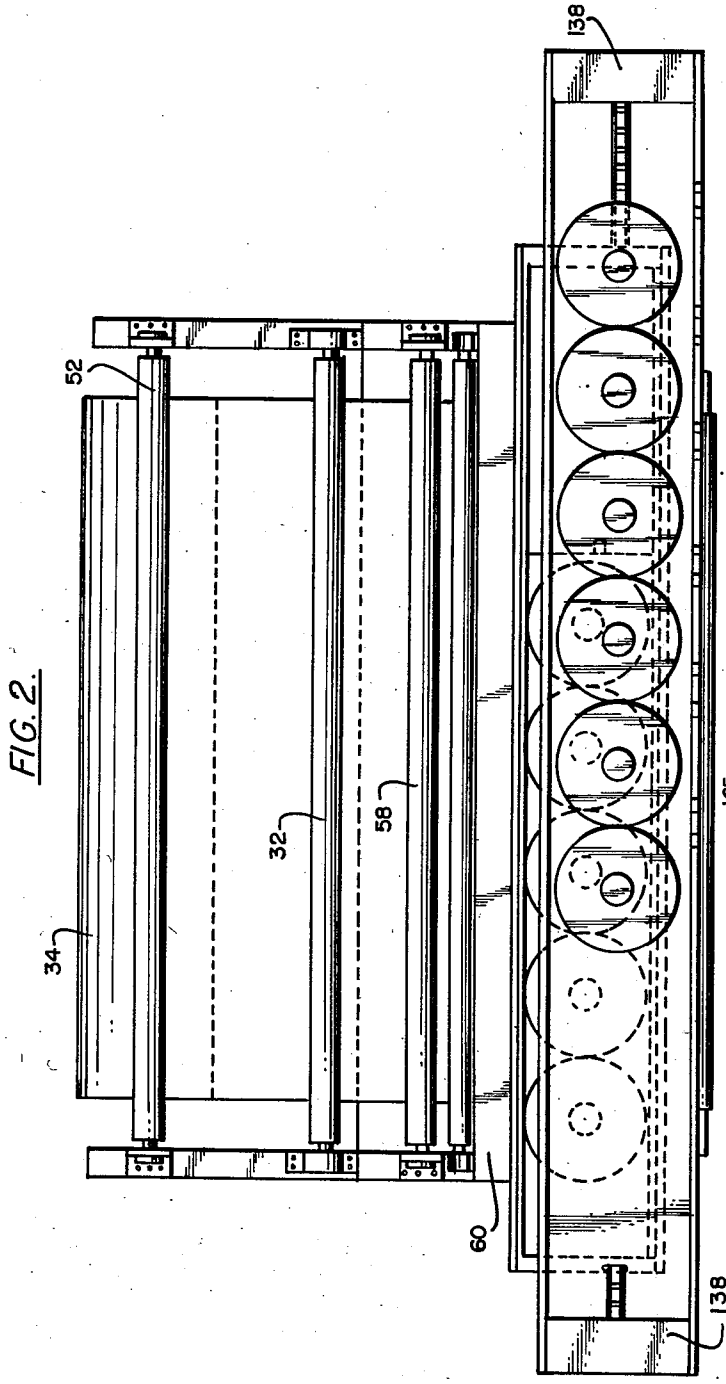


FIG. 2.

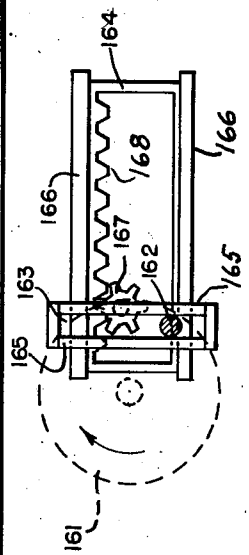


FIG. 11.

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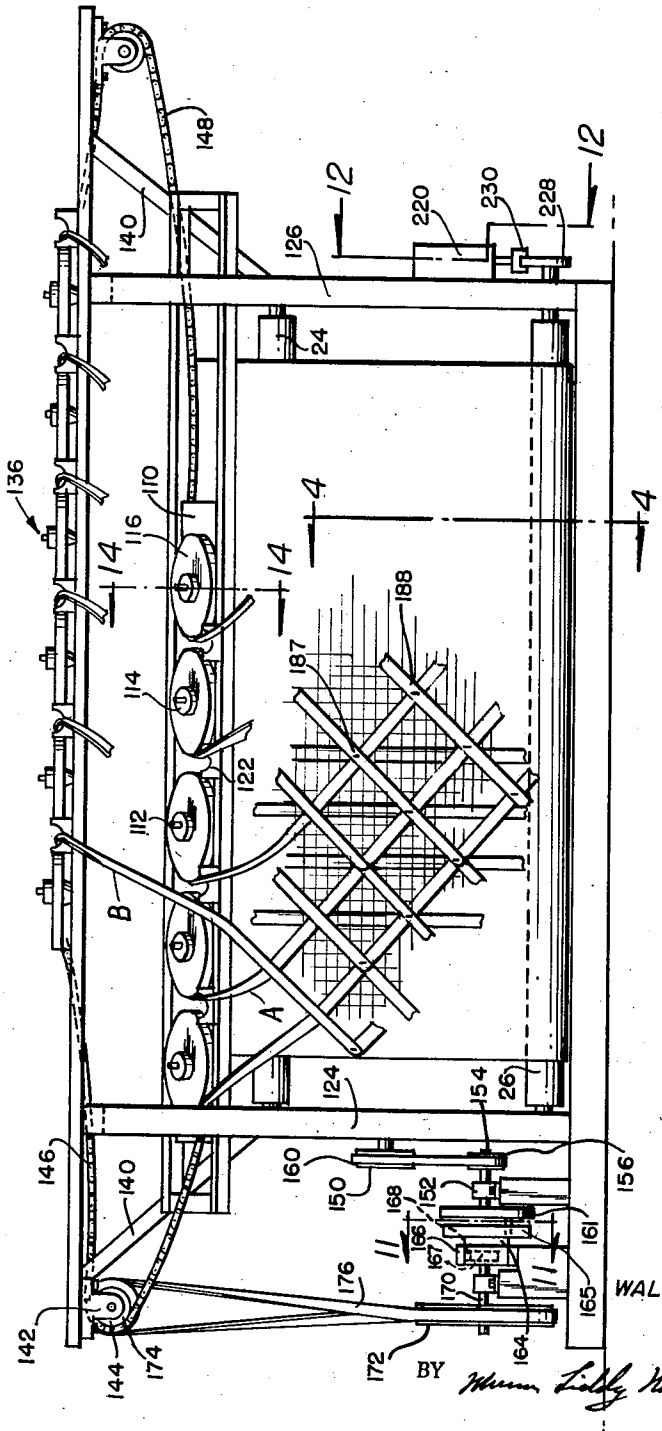
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June 18, 1957 W. M. LASKER 2,795,785

NET MANUFACTURING MACHINE

Filed Feb. 8, 1955 5 Sheets-Sheet 3

FIG. 3.



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June 18, 1957 W. M. LASKER 2,795,785

NET MANUFACTURING MACHINE

Filed Feb. 8, 1955 5 Sheets-Sheet 4

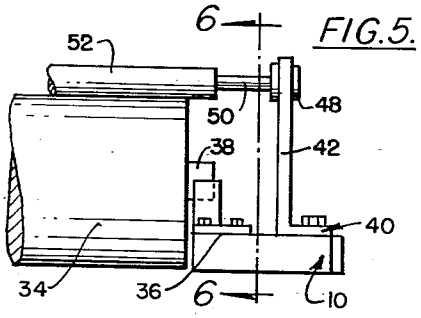


FIG. 5.

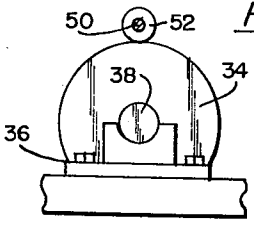


FIG. 6.

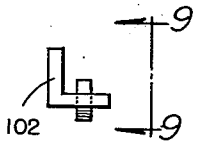


FIG. 8.

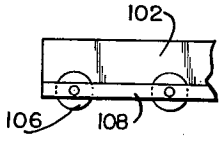


FIG. 9.

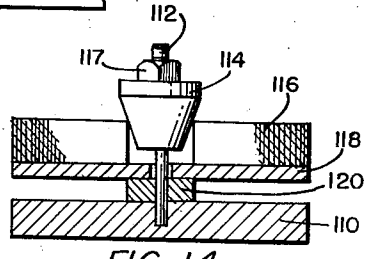


FIG. 14.

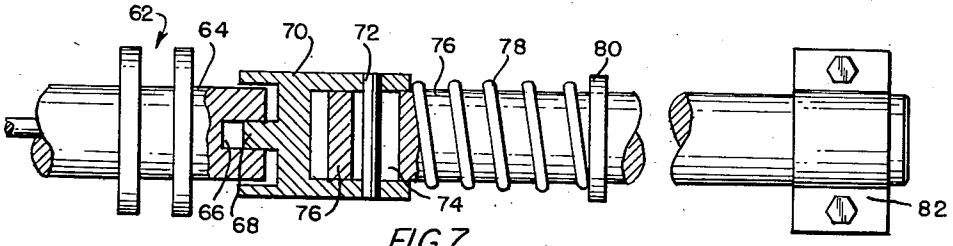


FIG. 7.

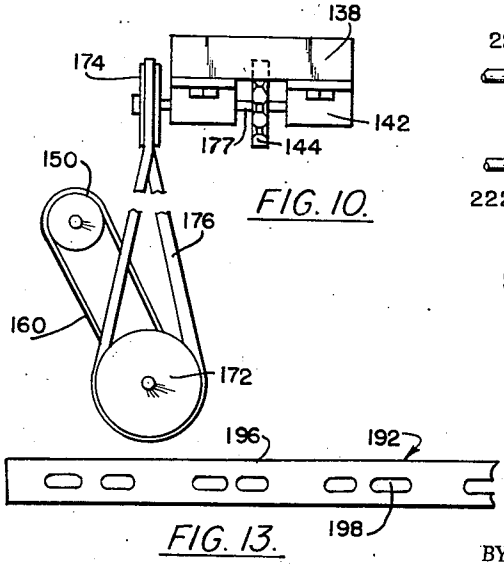


FIG. 10.

FIG. 13.

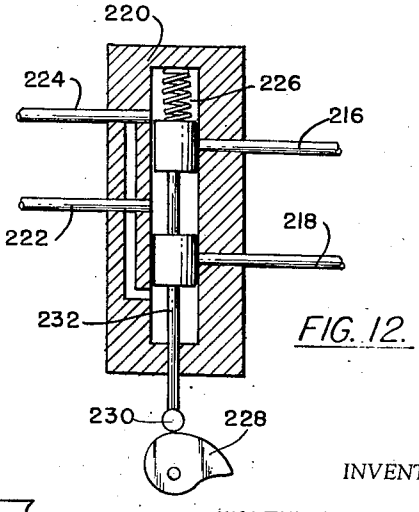


FIG. 12.

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June 18, 1957 W. M. LASKER 2,795,785

NET MANUFACTURING MACHINE

Filed Feb. 8, 1955 5 Sheets-Sheet 5

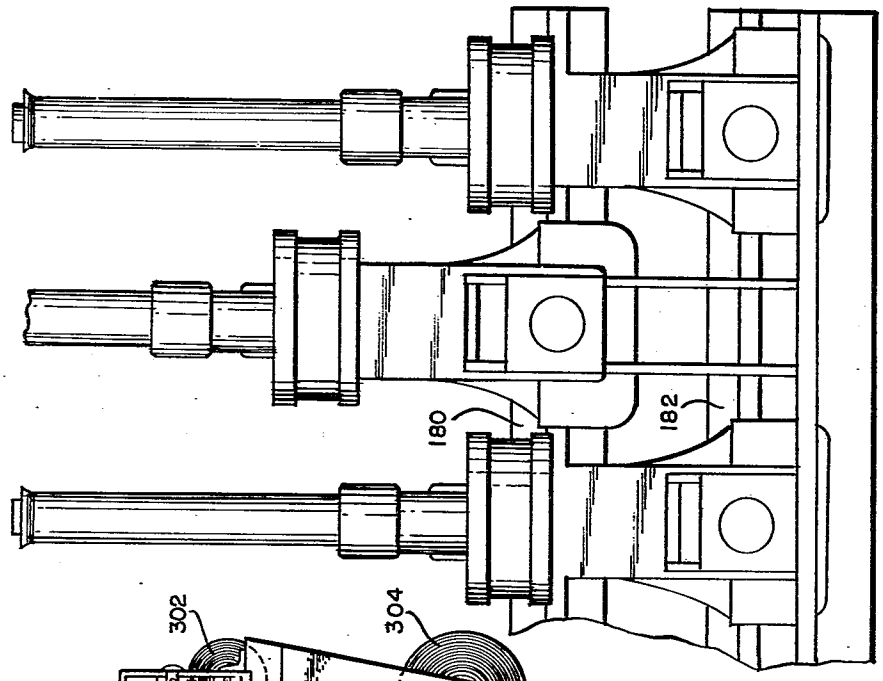


FIG. 15.

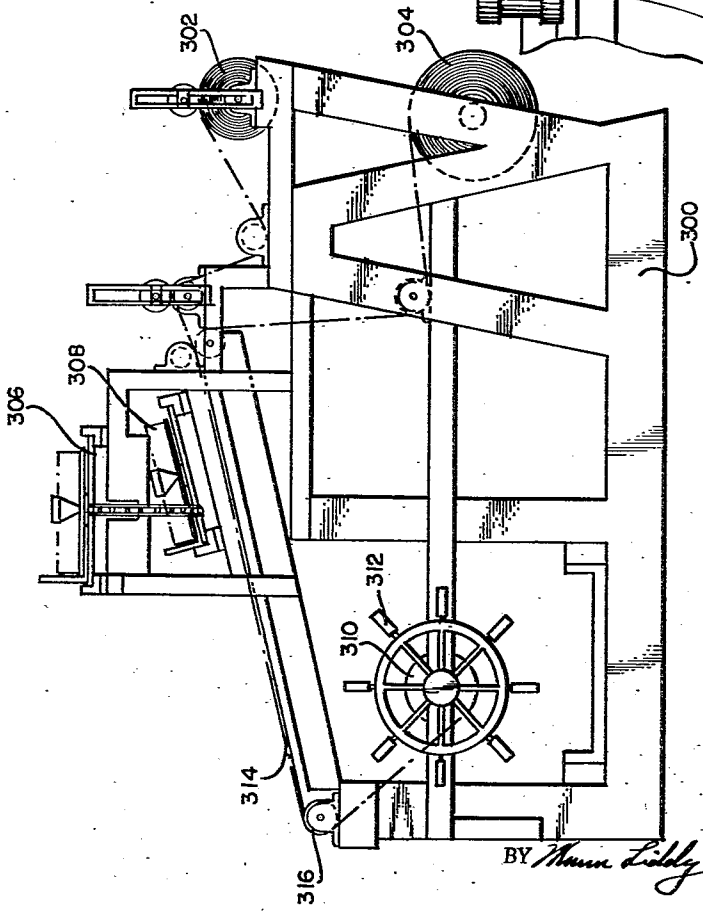


FIG. 16.

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United States Patent Office 2,795,785 Patented June 18, 1957

2,795,785

NET MANUFACTURING MACHINE

Walter M. Lasker, Morehead City, N. C.

Application February 8, 1955, Serial No. 486,918

10 Claims. (Cl. 1—2)

This invention relates to devices for overlaying sheet material and particularly to a net manufacturing machine.

In many instances it is necessary to combine sheets or strips of material in a continuous manner so as to produce a final product having a base and a superimposed design or configuration of a similar contrasting material. It is an object of my invention to devise a machine for continuously overlaying sheets or rolls of material to form a unitary sheet or roll and fastening the materials together.

The invention in preferred form is shown embodied in an apparatus for producing, for example, camouflage netting, such as used by the military services, to disguise installations. The camouflage material in its preferred form comprises a base composed of wires united at spaced points to form a sheet similar to chicken wire, and, in addition, has strips or tapes of colored fabric. The tapes are secured to the chicken wire at spaced points to form a design of colored strips upon the wire. Some of the tapes are laid in a criss-cross fashion on one side of the wire, while other tapes are positioned under the wire. The tapes are then affixed to the wire. Of course other forms of netting material can be used. So far as is known to applicant, camouflage netting has been previously made by hand only. The hand process consists of attaching the tape to rolls of chicken wire with hand-operated staplers, or by other methods of hand stitching. An object of my invention is to provide a machine for automatically performing this old hand operation.

A further object of my invention is to provide a continuous feed sheet manufacturing machine with means for automatically attaching over or underlaid material to a base.

Another object of my invention is to provide a machine having an automatic feed device for feeding sheet material and colored tapes or other sheet material, and an automatic stapling mechanism for stapling the materials together.

These and other objects and advantages will become apparent from the following description and the accompanying drawings, in which:

Figure 1 is a side elevational view of a machine constructed in accordance with the invention.

Figure 2 is a top plan view of the machine of Fig. 1.

Figure 3 is a front elevational view of the machine of Fig. 1, with some portions broken away.

Figure 4 is a fragmentary side sectional view looking along line 4—4 of Fig. 3, and showing a stapling attachment for stapling the netting. The scale of Fig. 4 is larger than that of the previously described figures for clarity of showing.

Figure 5 is a fragmentary view taken along line 5—5 of Fig. 1.

Figure 6 is a view taken along line 6—6 of Fig. 5.

Figure 7 is a view taken along line 7—7 of Fig. 1 with some elements broken away for clarity of showing.

Figure 8 is a partial view of a trackway forming a part of the invention.

Figure 9 is a fragmentary view taken along line 9—9 of Fig. 8.

Figure 10 is a partial side elevational view showing the left side of the machine as viewed in Fig. 3.

Figure 11 is a view taken along line 11—11 of Fig. 3.

Figure 12 is a sectional view taken along line 12—12 of Fig. 3.

Figure 13 is a front elevational view of a backup element forming a part of the invention.

Figure 14 is a sectional view taken along line 14—14 of Fig. 3.

Figure 15 is enlarged and elevational view of stapling machines forming a part of the invention.

Figure 16 is a side elevational view of a modified form of the invention.

Similar reference characters in the several figures indicate similar parts.

Referring now particularly to the drawings, a machine constructed in accordance with my invention comprises a stand **10** which consists of a base **14**, upstanding legs or supports **16**, **18**, **20**, etc., and suitable cross bracing members, all of which are not shown. Some of these members cooperate to form a front **22**. Horizontally extending rollers **24** and **26** are positioned in vertically spaced relationship across the front of the machine and are journalled in suitable bearings at each end. A third roller **28** is rotatably supported transversely on the stand and parallel to the first-mentioned rollers, as is a fourth roller **30**. Bearing blocks such as **32** can be used to support the rollers. At the rear of the machine means are provided for mounting a roll of chicken wire or other sheet material **34**. The means are more clearly shown in Figs. 5 and 6.

As illustrated in the latter two figures, pillow blocks **36** are mounted on stand **10**, and shaft **38** which can be used to form the central core of the roll of chicken wire **34**, rests on the pillow blocks.

Flanged guide posts **40** are mounted adjacent each pillow block and comprise an upright guide **42** having a pair of side rails **44** and **46**. A bearing block **48** having suitable slots for receiving the guide **44** and **46** is slidably mounted on each upright guide **42**. A shaft **50** is supported in the bearing blocks. Shaft **50** has mounted thereon a weighted roller **52** which may be surfaced with hard rubber, for example.

Roller **52** can be used to provide tension on the roll of chicken wire and to restrict unwinding thereof. Roller **52** may have a friction device for resisting turning thereof. Such a device might take the form of a rubber bushing fastened to bearing blocks **48** or any other suitable means for resisting rotating motion.

Guide roller **54** is mounted in bearing blocks supported by guide members **56** which are similar to guides **42**. An additional roller **58**, mounted above roller **54** and similar to roller **52**, serves as a means for tensioning the chicken wire. Yet another guide roller **60** is mounted so as to cooperate with roller **28** and serves as a tensioning device. At the lower rear of the machine there are provided means for mounting a series of rolls of tapes or a single roll of tape cut into strips, as indicated at **62**. The rolls of tape are mounted on a shaft **64**, as illustrated in Fig. 7. The shaft can be of a size such that the rolls are frictionally engaged therewith and positioned in spaced relation. Shaft **64** has a slotted end **66** which is adapted to cooperate with a key **68** provided on sleeve **70**. Sleeve **70** has a pin **72** mounted in slot **74** of shaft **76**. The sleeve is thus in sliding engagement with shaft **76**.

Spring **78** abuts against the sleeve and collar **80** fixedly positioned on shaft **76**. Shaft **76** can be rotatably supported on the stand by any convenient bearings such as

pillow blocks 82. Shaft 76 can be disengaged from shaft 64 by sliding sleeve 70 to the right as viewed in Fig. 7. When this is done, key 68 will leave slot 66 and shaft 64 can be removed. Shaft 64 is engaged with shaft 76 by placing shaft 64 in position and allowing sleeve 70 to slide to its conventional position in which key 68 is in slot 66. A sleeve can be provided for each end of shaft 64.

Lower guide roller 84 mounted in pillow block 86 serves to guide the tapes in their movement from roller 62 to roller 28. The tapes and chicken wire are fed over roller 28, roller 24 and roller 26 to a takeup roll 88. The take-up roll may comprise a central shaft similar to shaft 64 and can be engaged with shafts similar to shafts 76 and in the same manner. The latter shafts are rotatably mounted on the stand. Roll 88 is formed as the machine operates, whereas rolls 34 and 62 decrease in size during the operation of the machine. Any suitable arrangement can be provided for securing the ends of the chicken wire and tapes to the central shaft forming the roll 88. For example, the shaft can be slotted and the wire passed through the slot and bent over. The exact manner of mounting and tensioning the guide rollers can be modified to suit circumstances, such as the type of material, etc. For example, the roll 34 can be mounted in a trough instead of on a shaft. The trough would confine the roll but allow it to be payed out as needed.

Pulley 90 is connected to the fixed shaft for the takeup roller, and belt 92 serves to connect to a motor 94 having a cooperating pulley 96. By operation of motor 94 the chicken wire and tape is advanced over the rollers 24 and 26 vertically down the front of the machine. When the tape and wire is intermediate the rollers 24 and 26 stapling apparatus can be used to affix the tape to the wire.

The camourflage net being formed requires not only tapes in spaced relationship on one side of the chicken wire, but also an overlayment of tapes in criss-cross fashion on the opposite side of the wire. The tapes are stapled at spaced points in such a fashion that the overlying tapes are secured to the tape on the opposite side of the wire and to the wire itself, thus securing the tapes on both sides of the wire at one time.

I have provided a means for automatically and continuously overlaying the upper tapes in criss-cross fashion as the chicken wire and lower tapes are advanced through the machine past the stapling point.

At the upper front of the stand I mount plate elements 100 which form structural members at the side of the stand, and a pair of angle bracket-shaped members 102 and 104 which extend laterally of the stand and are supported on the plates. These angle bracket members can be provided with rollers in the base thereof, such as shown in Fig. 8 and Fig. 9. The rollers 106 are pivotally mounted in suitable openings provided in the base 108.

A slide frame 110 is slidably mounted on the trackway formed by members 102 and 104. The slide frame may consist of a single sheet of material as illustrated in Fig. 3, and has a series of spaced bolts 112 secured thereto and extending upwardly therefrom. Each of the bolts is threaded at its upper end and is provided with a cone-shaped washer 114. The cone-shaped washers cooperate with rolls of tape 116. The latter rolls have a central opening adapted to receive the cones. A plate 118 of circular shape, is also mounted on bolt 112 and is freely rotatable thereon. Bearings can be used if desired and the plate can be spaced from the slide frame 110 by a collar 120. By means of the cone-washer 114 and nut 117, the rolls of tape can be properly positioned on the bolts or spindle 112, and also the plate 118 can be forced against the collar 120 to supply friction during rotation of the plate.

Guides 122 are mounted on the slide frame in spaced relationship to the spindles, and the tape passes through the guides onto the upper surface of the chicken wire. Front members 124 and 126 extend above the lower slide frame and are connected by side elements 128 to rear support members 130 supported on plate 100. An upper trackway is formed by flange elements 132 and 134, and an upper slide frame constructed similarly to the lower slide frame previously described and indicated by reference character 136, is slidingly supported thereon.

The upper trackway extends laterally of the machine a greater distance than the lower trackway and at each end has brace elements 138 and angle braces 140. Pillow blocks 142 are mounted at each of the braces 138, and a shaft having a sprocket wheel 144 is rotatably mounted in the pillow blocks. Chains 146 and 148 are supported on sprocket wheels 144 and connected to the ends of the upper and lower slide frames.

At the left end of the machine, as viewed in Fig. 3, a pulley 150 is connected to the shaft used to support one end of roll 88. Bearing block 152 supports a shaft 154 having a pulley 156 mounted thereon. Belt 160 connects pulleys 150 and 156. Flywheel 161 is connected to shaft 154. Pin 162 is mounted on the flywheel and is received in a vertical slot 163 formed on slide frame 164 by spaced bars 165. Frame 164 is slidingly mounted in guides 166 supported on the machine frame. A gear 167 is in meshing engagement with rack 168 on slide frame 164. The gear is connected to shaft 170 which is in turn connected to pulley 174 by belt 176 and pulley 172.

As the flywheels 161 rotates, pin 162 moves vertically in slot 163. As seen in Fig. 11, this causes slide frame 164 to slide in guides 166. As the pin reaches what might be referred to as the 3 o'clock and 9 o'clock positions, the slide frame will be reversed, causing gear 167 to rotate first in one direction and then in the opposite direction. This movement of gear 167 is transmitted through belt 176 to pulley 174, then through chain 146 to the slide frames 110 and 136. Thus shaft 177 rotates first clockwise and then counter-clockwise; in turn, slide frames 110 and 136 move back and forth in opposite directions to each other on their respective trackways. This results in the criss-cross overlaying of the tapes A and B.

In Fig. 4, I illustrate a method of automatically attaching sheets of material comprising the chicken wire and the tapes. Frame 178 is secured to stand 10 and supports a bank of staplers arranged as indicated in Figs. 4 and 15. The staplers are connnected to longitudinally extending frame elements 180 and 182 and thus supported in two longitudinal rows. The frame elements are connected to base 184 by supporting members 186. The staplers are commercially available and do not per se constitute a part of my invention.

The staplers are positioned in two longitudinal rows, with those of the upper row being offset intermediate those of the lower row. Such positioning corresponds with the spacing of two longitudinally arranged rows of stapling points of the net indicated at 187 and 188 in Fig 3. Obviously the arrangement of staplers can be varied to suit the type of end product to be produced.

As illustrated in Fig. 4, the staplers can be provided with powered operating means indicated at 190. To supply a firm surface and to move the net to the staplers I use backup members 192 and 194 (see also Fig. 13). These backup members comprise a face plate 196 having cinch grooves or anvils 198 for cooperation with the staplers and a slide 200 extending rearwardly therefrom. Slides 200 are slidingly supported by longitudinally extending guide elements 202 and 204 connected to side supports 206 affixed to base 14. At their inner end slides 200 are coupled to piston rods 210 which are in turn connected to pistons mounted in cylinders 212. Cylinders 212 are fixedly secured in position by a post 214.

The pistons can be hydraulically actuated or operated by air. Also, of course, other types of motive devices can be used for moving backups 192 and 194. Conduits 216 and 218 lead from the cylinders to a valve box 220. Valve box 220 has a pressure inlet conduit 222 and an exhaust conduit 224. A spring loaded valve 226 is positioned in the valve housing, and the valve is normally

urged downwardly, as shown in Fig. 12. A cam **228**, a follower **230** and stem **232** are used to operate the valve. By using a double-acting piston and the valve arrangement shown in Fig. 12, positive operation of the pistons connected to the backups is assured. The cam **228** is attached to the shaft of roller **26** so as to be rotated thereby. Any convenient means can be used for supplying fluid under pressure to the valve box and backup operating cylinders.

By choosing the proper cam the backups can be made to operate so as to press against the stapling heads of the stapling machines at proper intervals. Obviously, the cam can be driven by a geared connection to any of the rollers, and the gears can be inserted or removed to change the frequency of operation of the staplers. The staplers are, of course, provided with suitable magazines and comprise heads which are self-feeding, that is, with which after a stapler has been driven and withdrawn from the head another stapler will appear in its place ready to be driven. Staplers which carry their own anvil in the head can be used, if desired, in which case the backup members do not have to be grooved in any particular fashion, and function to apply pressure against the staplers only.

Staplers employing a roll of wire instead of individual preformed staples can be used. The staplers operate whenever the back-ups operate. In Fig. 4 there is shown a valve box **240** having inlet conduit **242**, outlet conduit **244** and exhaust **246**. Conduit **244** leads to the powered operating means for the staplers. Valve stem **248** is pivotally connected to lever **250**. The latter is centrally pivoted in a block **252** supported on the frame in any convenient manner. The opposite end of the lever is pivotally connected to slide **200** as indicated at **254**. Piston rod **248** and associated piston is moved wherever slides **200** move. As the slides move outwardly towards the netting, the connected valve rod will move the valve to apply fluid pressure to the stapler operating means. As the slides move to return the backups to a neutral position, the associated valve will be moved to exhaust position. By choosing a proper linkage for connecting the valve operating rod **248** and slide **200**, the operation of the staplers can be delayed so that the back-ups will reach their forward-most position as the staplers come into operation.

While I have shown the back-up means as being slidably mounted and operable to move against the sheets of material, it is apparent that the back-up means could be fixedly mounted and the stapling or attaching devices moved to force the sheet materials against the back-up means. In such a machine the back-up means can comprise a plate mounted at the front of the machine. Also the fastening devices need not be stapling machines; any other suitable machine can be used—in fact, hand stapling devices can be used if a completely automatic machine is not needed.

In Fig. 3 there is illustrated a section of a camouflage net formed through use of my invention and the overlayment of the tapes in criss-cross fashion as illustrated. It is obvious that by use of proper sized pulleys, cams and cranks or geared connections if desired, the oscillation of the slide frames and the action of the staplers can be coordinated.

In Fig. 16 I show a modified form of my invention. As illustrated the modified form comprises a frame **300**, wire feed roll **302**, tape feed rolls **304**, slide frames **306**, **308**, each having a supply of tape rolls, a takeup roller **310** and suitable guide and tensioning rollers. A hand wheel **312** can be used to manually advance the material through the machine. Obviously, a power drive can be used. The tapes and wire progress over a front or table **314** having a generally flat upper surface serving as a backup for stapling operations, the table can have clinching grooves for cooperating with the staplers. Hand staplers can be used to fasten the tapes to the wire as the netting progresses through the machine over table **314**. Again it is apparent that fastening devices other than staplers can be employed. The slide frames are drivingly interconnected with the takeup roller **310**. Also automatic stapling machines can be used and a method of timing their operation in accordance with the rotation of roller **316**, for example, can be used. Such method could include a cam-controlled power device as illustrated in Figs. 4 and 12. Additionally, it is pointed out that in all modifications the staplers, or other devices, can be advanced against the netting by automatic means similar to what has been previously described.

While I have shown and described a preferred form of my invention, it will be understood that variations in details of form may be made without departure from the invention as defined in the appended claims.

I claim:

1. A machine for overlying sheet material comprising a stand, means for mounting a supply of a base sheet material on said stand, a slide frame slidably mounted on said stand for oscillation on said stand laterally of a base sheet material mounted on said stand by said means, means for mounting a number of second sheets of material on said slide frame in side by side relationship laterally of said base sheet, means for feeding said base and second sheets of material past a common point for attachment of said second sheets of material to said base sheet material, and a device connected to said last-named means for oscillating said slide frame as said materials are advanced past said common point.

2. A net manufacturing machine comprising a stand, said stand having a front, a roller mounted in longitudinally extending position on said front and supported on said stand, and a supply roller pivotally mounted on said stand and having a supply of sheet material, guide means between said roller and said supply roller for guiding said sheet material over said roller, a takeup roller for receiving said sheet material from said supply roller, drive means for rotating said takeup roller, spaced elements forming a trackway supported on said stand, a first slide frame slidably mounted on said trackway, a second trackway mounted above said first trackway, a second slide frame mounted on said second trackway, said slide frames being slidable laterally of said frame and said roller, means interconnecting said slide frames for oscillating movement thereof, and means connecting said slide frames to a power means for movement thereof, a source of sheet material mounted on said first and second slide frame and means guiding the sheet material from last named sources on to the first mentioned sheet material as said slide frames move on said trackways.

3. A net manufacturing machine comprising the apparatus set forth in claim 2 and including a lower roller positioned beneath the first mentioned roller, said sheet materials being movable over both of said rollers, a backup means positioned intermediate said two rollers and movable on said stand and engageable with said sheet materials when they are in overlying relationship to move said sheet materials outwardly of said stand, and a stapling device positioned opposite said backup means and engageable with said materials upon movement of said backup means to fasten said materials in fixed relationship, and means for moving said backup means into and out of engagement with said sheet material.

4. A net manufacturing machine comprising means for supplying sheet materials to a common point wherein said materials are in overlying relationship, a backup member positioned on one side of the normal location of said sheet materials adjacent said point and movable into engagement with the materials at said point, a stapling device positioned on the opposite side of said sheet materials at said common point and means for moving said backup device toward said stapling device to force said materials against said stapling device for fixing said materials in overlying relationship.

5. A machine for overlying sheet material comprising a

stand, means for advancing overlying sheets of material past a common point on said stand, a backup device comprising a plate slidably connected to said stand, fastening means positioned opposite said backup device in spaced relationship therewith, means for advancing sheet material between said backup device and said fastening means, means for sliding said plate on said stand to move said plate against said material, the last named means being operable to force said material against said fastening means, and means for operating said fastening means to fasten said sheets of material as said backup means forces said material against said fastening means.

6. A machine for overlying and attaching a first sheet material upon a base sheet material comprising a supply means for said base sheet material, a supply means for said first sheet material, a takeup means for collecting the first and base sheets of material and advancing them through the machine in a determined direction, means for attaching said first sheet material to said base sheet material in overlaid relationship between the supply means for the materials and the takeup means, said supply means for said first sheet material comprising a trackway forming a part of said machine, a slide frame mounted on said trackway and slidable along said trackway in a direction lateral of said determined direction, means for mounting a supply of first sheet material on said slide frame, guide means for said first sheet material mounted on said slide frame and adapted to guide said first sheet material on to said base sheet material, and means for moving said slide frame and guide means along said trackway as the takeup means advances and collects the sheets of material to cause said first sheet of material to alternately move in one direction and then in the opposite direction laterally of said base sheet material.

7. In the apparatus of claim 6, a second trackway on said machine, a second slide frame mounted on said second trackway and slidable along said second trackway laterally of said determined direction, means for mounting an additional supply of first sheet material on said second slide frame, means interconnecting both said slide frames for movement of said second slide frame along said second trackway as said sheet material advances through said machine.

8. The apparatus of claim 7 in which said first and said second slide frames are drivingly connected to said takeup means by means for moving said second slide frame in a direction opposite the direction of movement of the first mentioned slide frame.

9. The apparatus of claim 6 in which said machine further comprises a front portion defined in part by spaced rollers over which said base sheet is movable and between which said sheets are united, and means for uniting said sheets comprising a backup member and a stapling member, one of the last named members being movable to force said sheets of material against the other of said members and to attach said sheets of material to each other.

10. The apparatus of claim 6 comprising a third sheet material supply means mounted on said machine, said takeup means being adapted to collect said third sheet of material with said first and base sheets of material.

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