

May 23, 1972

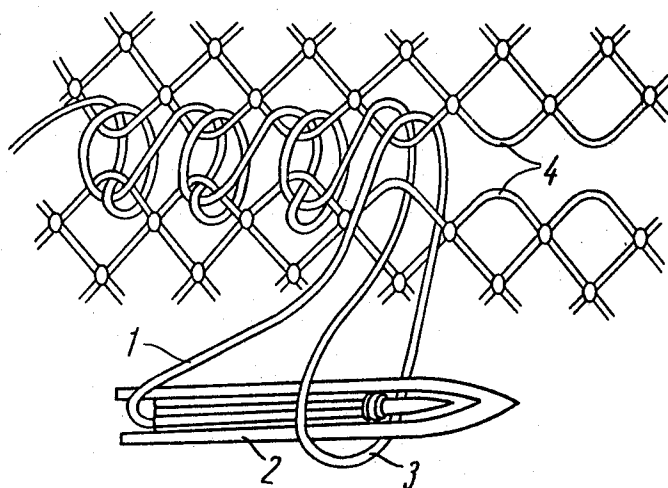
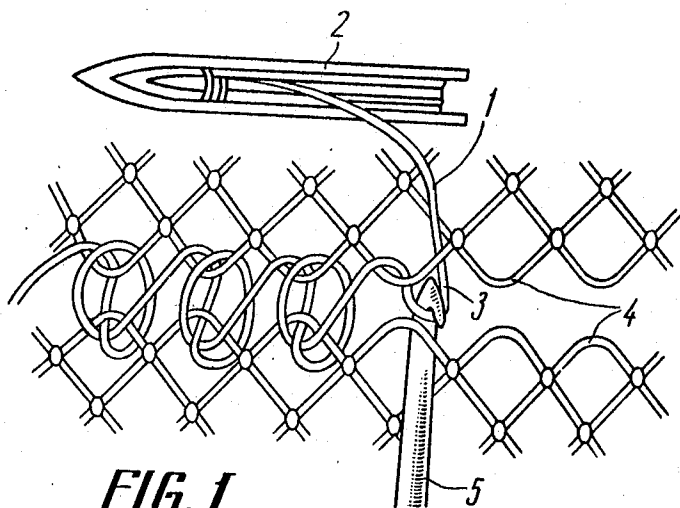
M. PAJULAIK ET AL

3,664,694

APPARATUS FOR SEWING TOGETHER NET SHEETS

Filed Sept. 16, 1970

6 Sheets-Sheet 1





May 23, 1972

M. PAJULAI ET AL

3,664,694

APPARATUS FOR SEWING TOGETHER NET SHEETS

Filed Sept. 16, 1970

6 Sheets-Sheet 2

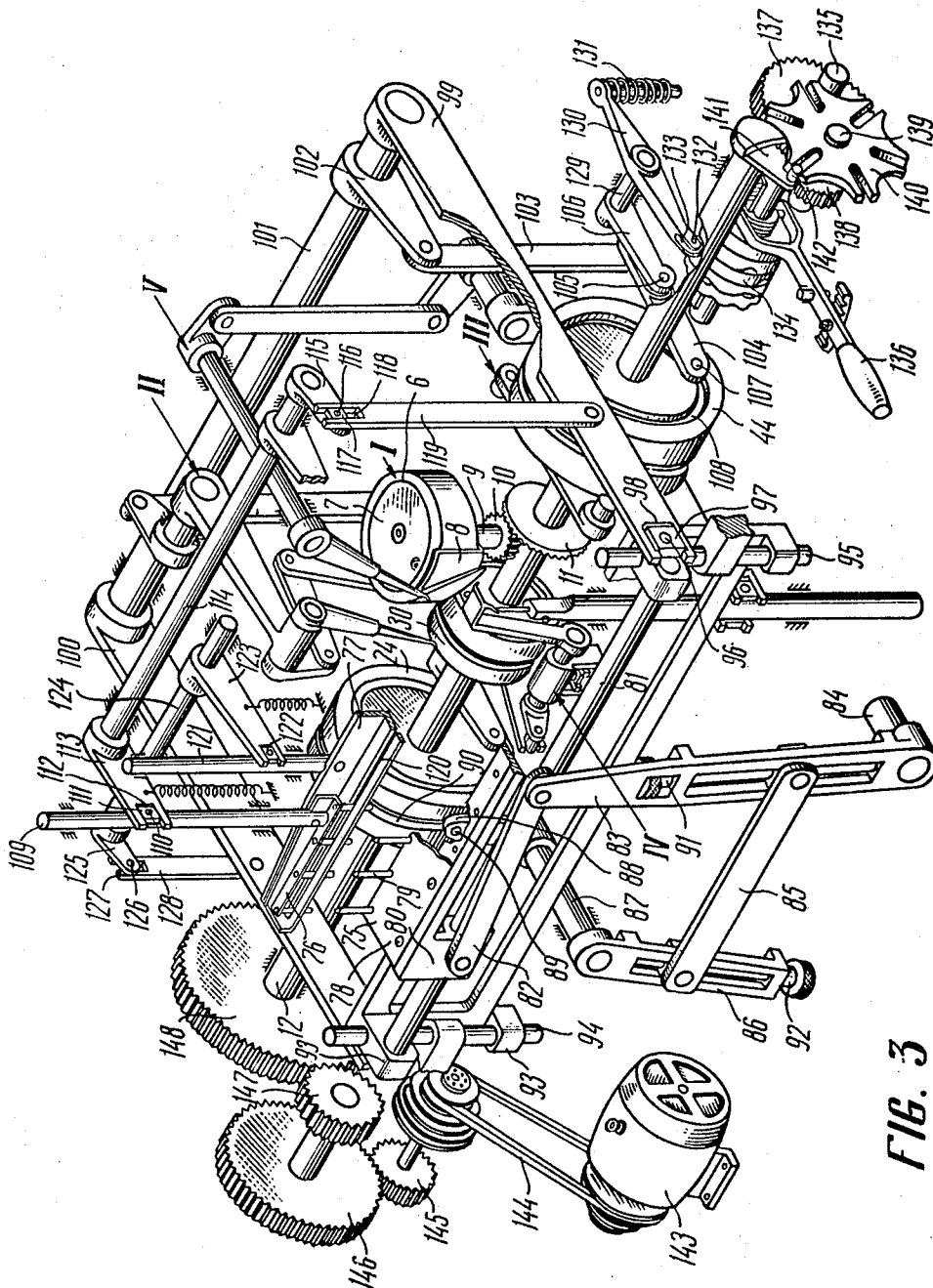


FIG. 3



**May 23, 1972**

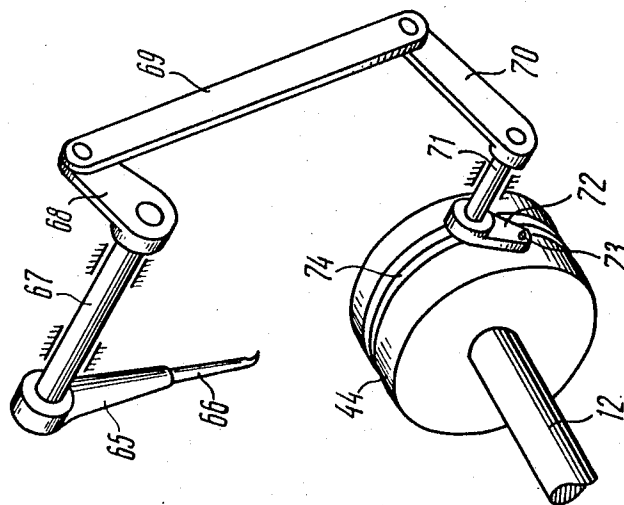
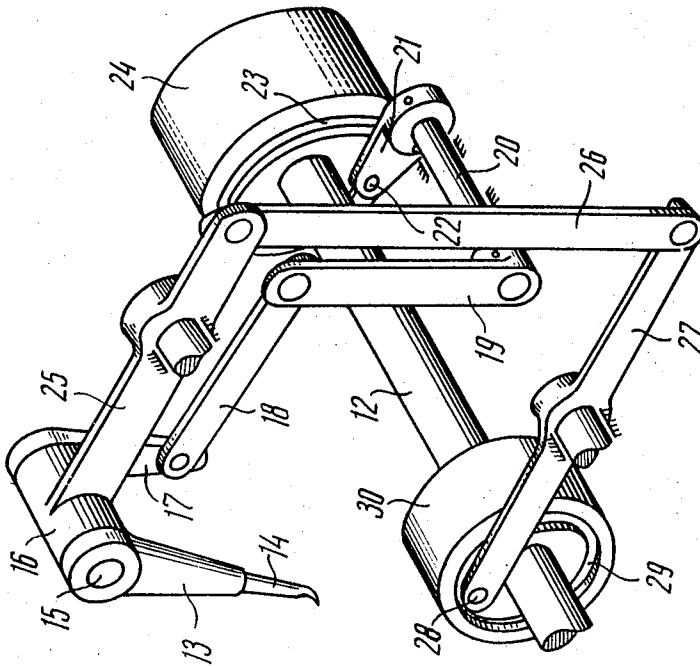
M. PAJULAID ET AL

**3,664,694**

# APPARATUS FOR SEWING TOGETHER NET SHEETS

Filed Sept. 16, 1970

6 Sheets-Sheet 3





May 23, 1972

M. PAJULAI ET AL

3,664,694

APPARATUS FOR SEWING TOGETHER NET SHEETS

Filed Sept. 16, 1970

6 Sheets-Sheet 4

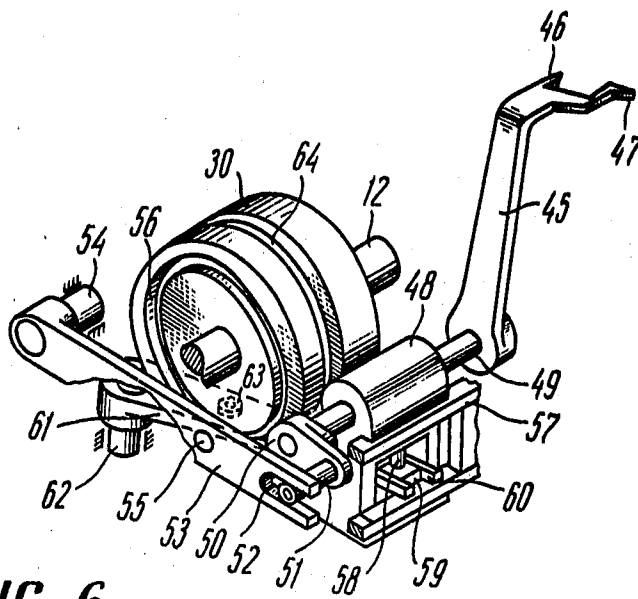


FIG. 6

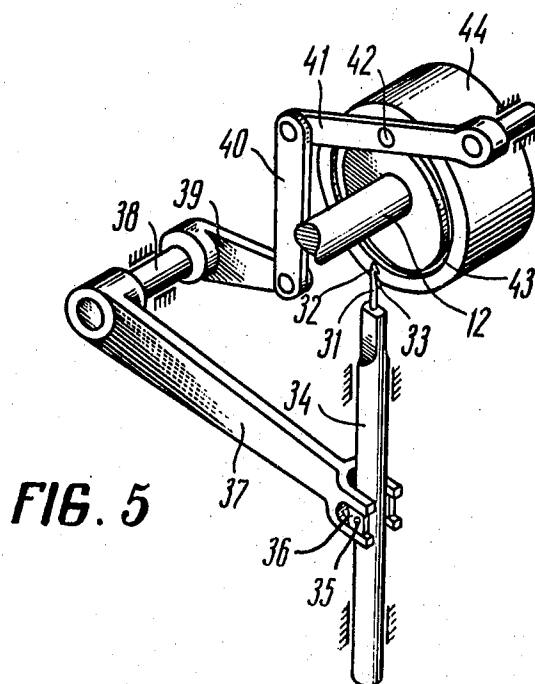


FIG. 5



May 23, 1972

M. PAJULAI ET AL

3,664,694

APPARATUS FOR SEWING TOGETHER NET SHEETS

Filed Sept. 16, 1970

6 Sheets-Sheet 5

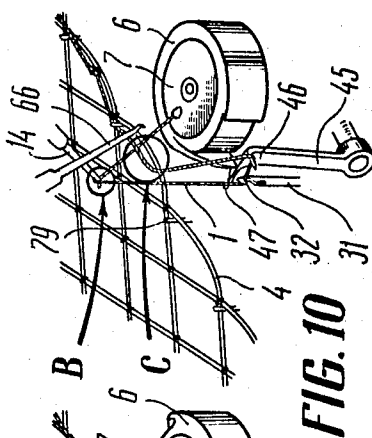


FIG. 10

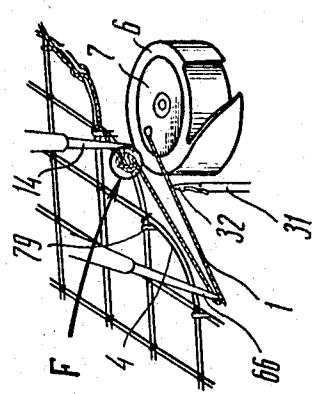


FIG. 13

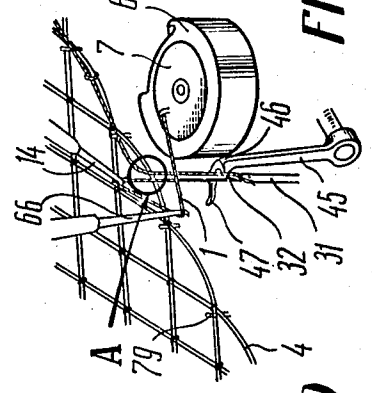


FIG. 9

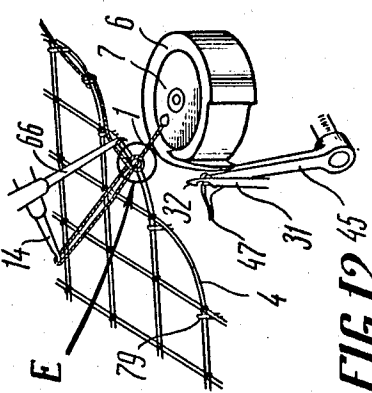


FIG. 12

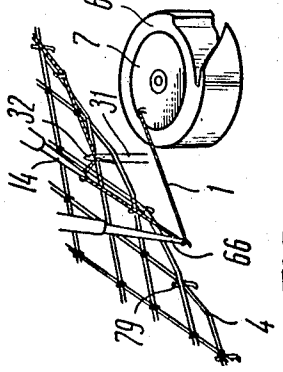


FIG. 8

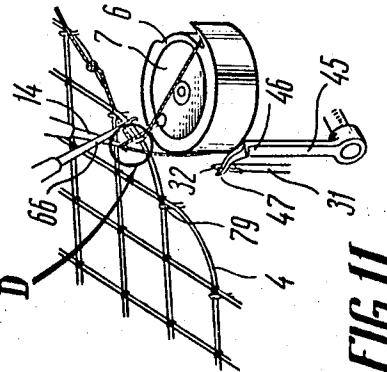


FIG. 11



May 23, 1972

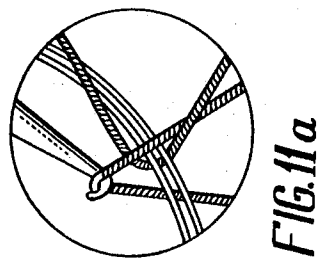
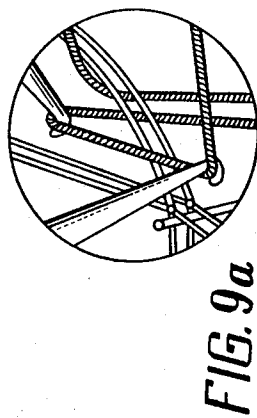
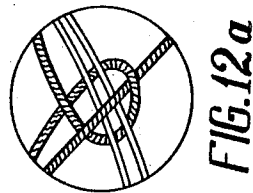
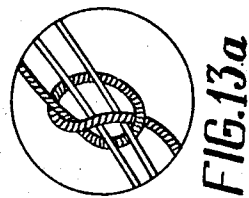
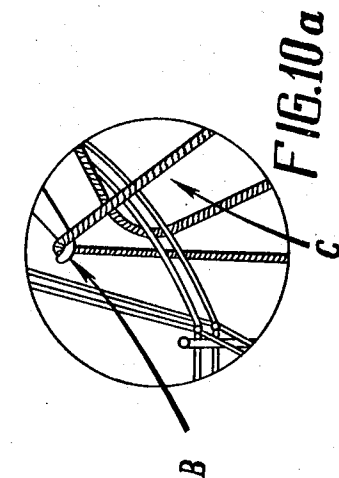
M. PAJULAIID ET AL

3,664,694

APPARATUS FOR SEWING TOGETHER NET SHEETS

Filed Sept. 16, 1970

6 Sheets-Sheet 6





1

3,664,694  
**APPARATUS FOR SEWING TOGETHER  
NET SHEETS**

Manivald Maximovich Pajulaid, Roo 10, kv. 6 ulitsa, and  
Khugo Gustavovich Tooming, Ulitsa Waphu 8, kv. 24,  
both of Tallin, U.S.S.R.

Filed Sept. 16, 1970, Ser. No. 72,795  
Int. Cl. B65h 69/04

U.S. Cl. 289—18

6 Claims

**ABSTRACT OF THE DISCLOSURE**

A machine for sewing net sheets together includes a shuttle carrier having a shuttle for jointing thread. A device is provided for pulling a loop out of the shuttle and a device is provided for threading the loop taken therefrom through the meshes of the net sheets. Still further there is provided a mechanism for expansion of the loop and a mechanism for tightening the knot formed as a result of the shuttles passing through the loop.

This invention relates to industrial fishing and more particularly to the methods of manufacturing net-type fishing gear, for example, trawls and seines.

Known in the art are methods of sewing together net sheets with a non-loosening seam, using a jointing thread, according to which the shuttle with the wound-on thread is drawn successively through the net meshes with the purpose of their jointing, and also with the purpose of knot formation.

These methods are suitable exclusively for manual sewing together of net sheets, when the shuttle is selected depending upon the size of the net mesh.

Therefore it is very difficult to mechanize the conventionally known methods of sewing together net sheets because the perimeter of the cross-section of the shuttle used to sew together the nets with different mesh perimeters (from 20 to 800 mm.) and vary in accordance with the latter. However, it is technically impracticable to mechanize the process of sewing together the nets when a large number of shuttles with different perimeters are used.

An object of this invention is to provide such a method of sewing together net sheets which would enable this process to be mechanized, and to develop a machine for the realization of said method.

Another object of this invention is to provide such a method of sewing together net sheets which would render unnecessary the drawing of the shuttle through the net meshes.

In accordance with the above-specified and other objects of this invention, when effecting the method invested by us, at first a certain length of the thread from the shuttle is pulled through the meshes of the net sheet in the form of a loop, after which the shuttle with the wound-on thread is drawn through said loop.

The employment of this method of sewing together net sheets renders the drawing of the shuttle through the net meshes unnecessary.

Besides, since loops of any length can be pulled through the net meshes, according to this method the nets with meshes of different perimeters can be sewn together using only one shuttle.

This provides for the mechanization of sewing together of the net sheets.

With the purpose of mechanization of said method of sewing together net sheets, the present invention provides a machine which comprises the following operatively associated mechanisms: a shuttle carrier with a shuttle for the jointing thread; a mechanism for pulling out the loop

2

from said shuttle; a mechanism for threading said loop taken from the mechanism for pulling out the loop, through the meshes of the net sheets to be jointed; a mechanism for the expansion of the loop taken from the mechanism for loop threading-through; and a mechanism for tightening the knot formed as a result of drawing said shuttle through said loop.

It is expedient that the mechanism for pulling out the thread loop from the shuttle should comprise a rod with a hook cantilevered on the end of a shaft installed in a bearing, while the opposite end of said shaft and its bearing be connected by a system of levers and roller pins to cam drums which set the rod with the hook in swinging motion.

According to the preferable type of embodiment, the mechanism for threading the loop through the net meshes comprises a needle with a hook and a clip for gripping the thread, said needle being fastened to a rod connected by a system of levers, a link, shaft and roller pin to the cam drum which causes the rod with the needle to reciprocate.

The mechanism for the expansion of the loop and its removal from the needle of the mechanism for threading the loop through the net meshes can have the shape of a curved rod with a pointed end and a shank, said rod being cantilevered on a shaft mounted in a bearing, said shaft being connected by a system of levers to a roller pin which interacts with a slot of the cam drum, said drum setting said lever carrying said curved rod in swinging motion, while reciprocation of said shaft is ensured due to that the bearing interacts through the lever and roller pin with the other slot of said cam drum.

According to the preferable type of embodiment of the mechanism for knot tightening, said mechanism may comprise a rod with a hook cantilevered to the end of the shaft, the opposite end of said shaft being connected by means of a system of levers, shaft and link to the roller pin which interacts with the slot of the cam drum which ensures swinging motion of the lever with the hook.

The machine according to this invention should preferably comprise a device for feeding the net sheets in the process of their sewing together, said device comprising two operatively associated combs and a hold-down board. One of the combs is made fast to a slide block reciprocable in the horizontal and vertical planes, while the other comb and hold-down board are reciprocatingly mounted on rods.

The specific features and advantages of this invention will appear more completely from the following description of a typical embodiment thereof which is given by way of example with reference to the accompanying drawings, in which:

FIGS. 1 and 2 show the schematic diagram of sewing together net sheets according to this invention;

FIG. 3 is a schematic arrangement diagram of the general view of the machine provided for the embodiment of the method of sewing together net sheets according to this invention;

FIG. 4 is the mechanism for pulling out the loop from the shuttle according to this invention;

FIG. 5 is the mechanism for threading the loop through the meshes of the net sheets according to this invention;

FIG. 6 is the mechanism for the expansion of the loop and its removal from the needle according to this invention;

FIG. 7 is the mechanism for tightening the knot according to this invention;

FIGS. 8-13 are the diagrams of sewing together of net sheets by the machine of the present invention.

The proposed method of sewing together net sheets with the non-loosening seam is effected manually in the following way. A certain length of thread 1 (FIG. 1)



from shuttle 2 is pulled through the meshes 4 of the net sheet in the shape of a loop 3 with the aid of hook 5 after which the shuttle 2 with the thread 1 is drawn through said loop 3 (FIG. 2).

When it is desired to obtain the seam of an extra-high strength, the loop can be threaded through each pair of meshes of the net sheets being jointed several times in succession, while several rows of the meshes located along each sheet edge can be taken up into the seam.

For effecting said method using a mechanical means, a machine for sewing together net sheets with a non-loosening seam is proposed herein, said machine being shown in FIGS. 3-7.

The machine for effecting the herein proposed method of sewing together net sheets with the non-loosening seam comprises the following mechanisms kinematically connected by a common drive shuttle mechanism I of the shuttle (FIG. 3); mechanism II for pulling out the loop (FIG. 4); mechanism III for threading the loop through the meshes of the net sheets (FIG. 5) mechanism IV for the expansion of the loop (FIG. 6); mechanism V for tightening the knot (FIG. 7); device for feeding the net sheets (FIG. 3); programmer (FIG. 3) and machine drive (FIG. 3).

The shuttle mechanism comprises shuttle 6 with spool 7 (FIG. 3), said shuttle being set in motion by shuttle carrier 8 mounted on vertical shaft 9 and connected through gears 10 and 11 to vertical shaft 12 of the machine.

The shuttle mechanism I is intended to draw the thread spool through the loop formed by the same thread.

The mechanism II for pulling out the thread loop is designed to form a loop from the jointing thread, to transfer said loop to the mechanism for threading the loop through the net meshes, and to pull out the loop after the shuttle 6 passes through it.

The mechanism II for pulling out the thread loop comprises rod 13 (FIG. 4) with hook 14. The rod 13 is cantilevered on the end of shaft 15 which is mounted in bearing 16. To ensure swinging motion of the rod 13 with the hook 14 in the bearing 16, the shaft 15 is connected through lever 17 and link 18 to lever 19 which is fastened to the end of shaft 20, the latter being in turn connected through lever 21 and roller pin 22 to slot 23 of cam drum 24 mounted on the main shaft 12.

The second swinging motion of the rod 13 with the hook 14 together with the bearing 16 is effected through rocker arm 25, link 26, double-arm lever 27 and roller pin 28 from slot 29 of cam drum 30.

The mechanism III for pulling the thread loop through the meshes of the net sheet comprises needle 31 (FIG. 5) with hook 32 and clip 33, said needle being mounted on rod 34. The rod 34 is connected through pin 35 carrying slide block 36, lever 37 and shaft 38 to lever 39. The lever 39 in turn is connected through link 40 to lever 41 carrying roller pin 42 in its middle part, said pin interacting with the slot 3 of cam drum 44 located on the main shaft 12 and ensuring the reciprocation of the needle 31.

The mechanism IV for the expansion of the loop and its removal from the needle 31 comprises rod 45 (FIG. 6) having sharp point 46 and shank 47, said rod being cantilevered on shaft 49 installed in bearing 48.

To ensure swinging motion the shaft 49 has lever 50 with roller pin 51, said lever interacting with slot 52 of lever 53. The opposite end of the lever 53 is fastened to shaft 54, while in its middle part there is roller pin 55 interacting with slot 56 of cam drum 30.

To ensure reciprocation of the rod 45 the bearing 46 is made in the shape of a slide block movable along frame 57 with the aid of pin 58 with slide block 59 interacting with slot 60 of lever 61 mounted on axle 62 and carrying roller pin 63 in its middle part.

The pin 63 interacts with slot 64 of the cam drum 30 mounted on the main shaft 12.

The mechanism V for tightening the knot (FIG. 7) has rod 65 with hook 66. The rod 65 is cantilevered on the

end of shaft 67, while the opposite end of said shaft carries lever 68 which is connected by link 69 to lever 70.

The lever 70 is fastened to the end of shaft 71, while the opposite end of said shaft carries lever 72 with roller pin 73 interacting with slot 74 of the cam drum 44 which is mounted on the main shaft 12.

The device for feeding the net sheets in the course of sewing together (FIG. 3) comprises lower comb 75 and upper comb 76 operatively associated with each other, and hold-down board 77.

The lower comb 75 is made as metal strip 78 with pins 79 reciprocating in the horizontal and vertical planes.

The comb 75 is fastened to slide block 80 which is movable along horizontal shaft 81 and is driven by connecting rod 82, one of its ends being hinged to the slide block 80, and the opposite end, to lever 83 turnable on axle 84. The lever 83 is hinged through link 85 to lever 86 which is held in position by means of pin 89 interacting with slot 90 of the cam drum 24.

In order to vary the horizontal stroke of the lower comb 75, the levers 83 and 86 are provided with adjusting screws 91 and 92 which control the position of the link 85 and, consequently, the stroke of the comb 75. To ensure reciprocation of the comb 75 in the vertical direction, the horizontal shaft 81 is fastened on frame 93 which is movable on axes 94 and 95 and which through axle 96 with slide block 97 interacts with slots 98 of levers 99 and 100 made fast to the ends of shaft 101. Mounted on the shaft 101 is lever 102 connected through link 103 to rocker arm 104 carrying axle 105 in its middle part, said axle being fastened to the end of lever 106. The opposite end of the rocker arm 104 carries roller pin 107 interacting with slot 108 of the cam drum 44.

The upper comb 76 is intended to retain the meshes of the net sheets being sewn together in a spread-out condition while the lower comb 75 is in movement. The upper comb 76 is fastened to rod 109 which is connected through pin 110 having slide block 111 to slot 112 of spring-loaded lever 113. The lever 113 is mounted on shaft 114 whose opposite end carries lever 115 which interacts through pin 116 having slide block 117 with slot 118 of fork 119 hinged to the lever 99 which sets said fork in motion.

The hold-down board 77 is intended to hold down and retain the meshes of the net sheets being sewn together during the time of seam formation. The hold-down board has a longitudinal slot 120 for the passage of the pins of the combs 75 and 76, and reciprocates in the vertical plane. The hold-down board is mounted on rod 121 connected to slot 122 of spring-loaded lever 123. The lever 123 is fastened on shaft 124 connected to lever 125 which interacts through pin 126 having a slide block (not shown in the drawing) with slot 127 of fork 128 hinged to the lever 100 which sets said fork in motion.

The programmer is designed to ensure the formation of one or two knots of the jointing thread per each pair of the net meshes, also to ensure correct intermitting of double and single knots in the specified sequence, by causing an idle stroke of the lower comb 75 after a certain number of working strokes thereof. This is achieved due to that the axle 105 of the rocker arm 104 is fastened to the end of the lever 106 whose opposite end is fastened to shaft 129, the opposite end of said shaft carrying lever 130. One end of said lever bears against spring 131 while its opposite end has an axle 132 with roller 133. The roller interacts with one of the programmer discs 134.

The programmer discs 134 are fitted on shaft 135 and are movable therealong by means of handle 136. Thrust on the shaft 135 is gear 137 which meshes with gear 138 fitted on shaft 139 which mounts Maltese cross 140. Said Maltese cross is set in intermittent rotary motion from crank 141 through roller pin 142.

The mechanisms of the machine are driven from an electric motor 143 through a V-belt drive 144, a train



5

of gears 145, 146, 147 and 148, the torque being transmitted to the main shaft 12 which mounts the cam drums 24, 30 and 44.

The sewing together of the net sheets with the aid of the machine proposed herein is accomplished in the following way.

The net sheets with the spread-out edges placed one over the other are manually delivered to the device for feeding the net sheets. The spool 7 with the jointing thread 1 is placed into the shuttle 6 (FIG. 8), the end of said thread being pulled out and retained manually until the machine forms a knot on the first meshes of the net sheets being sewn together. Upon starting of the electric motor 143 the motion is transmitted to the main shaft 12. As a result of shaft rotation the hook 14 catches the thread 1 and, while turning, places said thread on the hook 32 of the needle 31. At this moment the hook 66 loosens the thread 1. Next the needle 31 pulls the loop of the thread 1 through the meshes 4 of the net sheets being jointed (FIG. 9).

At this stage the sharp point 46 of the rod 45 enters the loop and, while turning, spreads out said loop, into which the nose of the shuttle 6 is now inserted.

In order to release the thread 1 from the hook 33 of the needle 31 the latter is caused to move upwards, so that the shank 47 removes the loop from the hook 32 (FIG. 10).

In order to form a knot the shuttle 6, while rotating, guides the loop of the jointing thread 1 about itself, while the hook 14 loosens the thread (FIG. 11). The thread having passed around the shuttle 6, the hook 14 pulls out the loop taken from the shuttle 6 (FIG. 12).

Next the hook 66 tightens the knot by making a swinging motion about its axis (FIG. 13).

After tightening the knot, the pins 79 of the lower comb 75 move the next pair of meshes of the net sheets being sewn together into the position for knot formation, and the entire cycle takes place again, as described above.

Each complete turn of the main shaft 12 ensures the formation of one knot.

In order to connect the meshes of the net sheets by a double knot the lower comb 75 is caused to make an idle stroke consisting in that the lower comb 75, while moving, passes below the net sheet, without contacting it. As a result, the net sheets remain in the previous position, and the subsequent knots are formed in the same meshes, i.e. two knots per each mesh.

What is claimed is:

1. A machine for sewing together net sheets comprising the following operatively associated mechanisms: a shuttle carrier with a shuttle for the jointing thread; a mechanism for pulling out a loop from said shuttle; a mechanism for threading said loop taken from the mechanism for pulling out the loop, through the meshes of the

6

net sheets; a mechanism for the expansion of the loop taken from said mechanism for threading-through the loop; a mechanism for tightening the knot formed as a result of said shuttle passing through said loop.

2. A machine as claimed in claim 1, wherein the mechanism for pulling out the thread loop comprises a rod with a hook, said rod being cantilevered on the end of a shaft installed in a bearing, the opposite end of said shaft and its bearing being connected through a system of levers and roller pins to cam drums which set the rod with the hook in swinging motion.

3. A machine as claimed in claim 1, wherein the mechanism for pulling the thread loop through the meshes of the net sheet comprises a needle with a hook and a clip for gripping the thread, said needle being fastened to a rod connected through a system of levers, a link, shaft and roller pin to a cam drum which causes the rod with the needle to reciprocate.

4. A machine as claimed in claim 1, wherein the mechanism for the expansion of the loop and its removal from the mechanism for loop threading-through comprises a curved rod with a sharp point and a shank, said rod being cantilevered on a shaft installed in a bearing, said shaft being connected by a system of levers to a roller pin which interacts with slot of a cam drum imparting swinging motion to the lever, the bearing interacting through a lever and a roller pin with another slot of the cam drum to ensure reciprocation of the lever.

5. A machine as claimed in claim 1, wherein the mechanism for tightening the knot comprises a rod with a hook, said rod being cantilevered on the end of the shaft, the opposite end of said shaft being connected by means of a system of levers, a shaft and a link to a roller pin which interacts with the slot of the cam drum ensuring the swinging movement of the lever with the hook.

6. A machine as claimed in claim 1, wherein a device is provided for feeding the net sheets in the course of their sewing together, said device comprising two combs operatively associated with to each other, and a hold-down board, one of said combs being fastened to a slide block reciprocating in the horizontal and vertical planes, and the other comb and the hold-down board being reciprocatingly mounted on rods.

#### References Cited

##### UNITED STATES PATENTS

262,140	8/1882	Sollers	28—15	UX
2,106,119	1/1938	Krasselt	28—72	
2,747,246	5/1956	Oldham	289—17	X

##### FOREIGN PATENTS

693,313	6/1953	Great Britain	87—12
---------	--------	---------------	-------

LOUIS K. RIMRODT, Primary Examiner