Feb. 6, 1973 R. F. RAWLINGS ET AL Re. 27,577

SHELL STRINGER APPARATUS

Original Filed Sept. 1, 1966 4 Sheets-Sheet 1

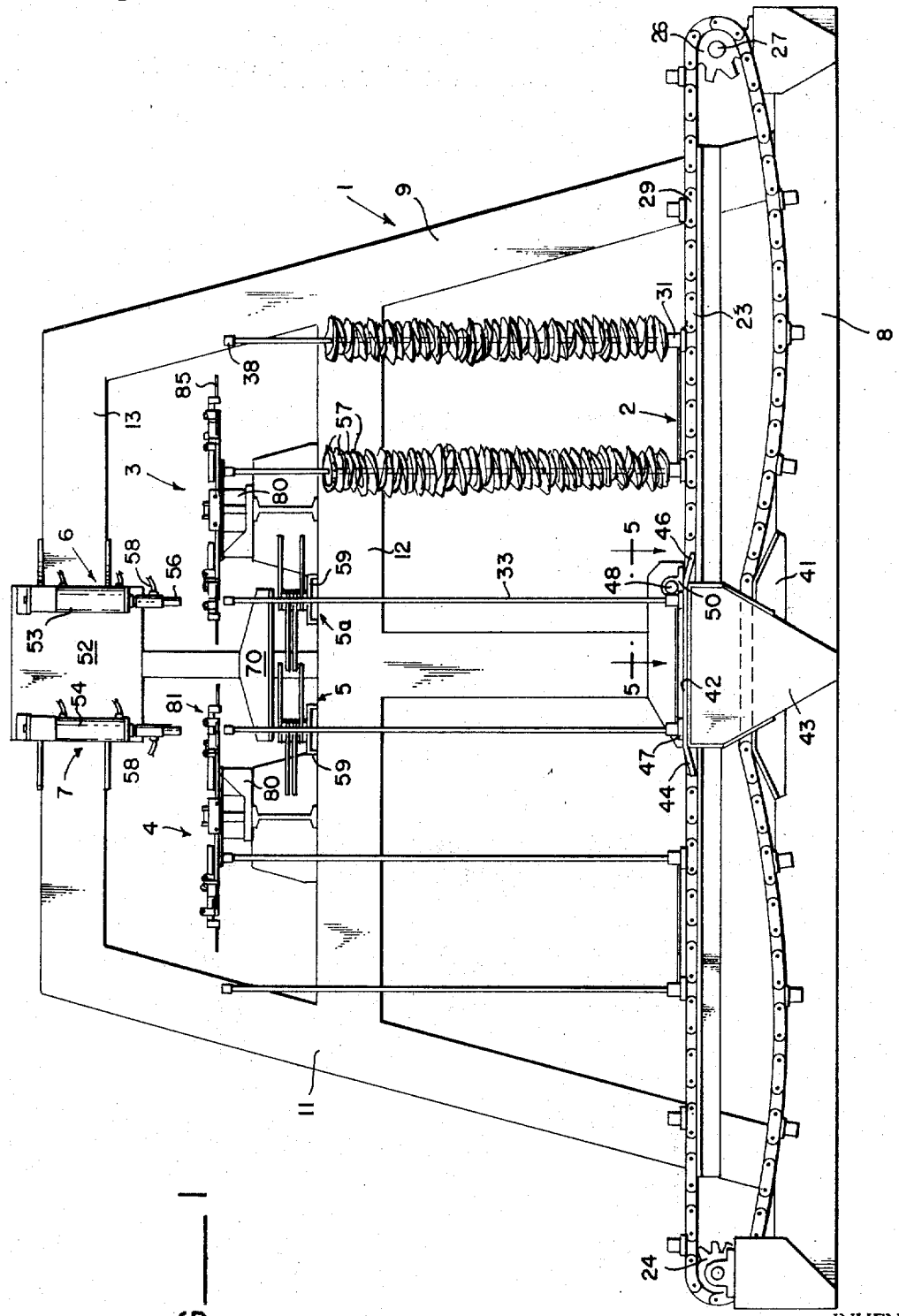


FIG. 1

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SHELL STRINGER APPARATUS

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FIG. 2

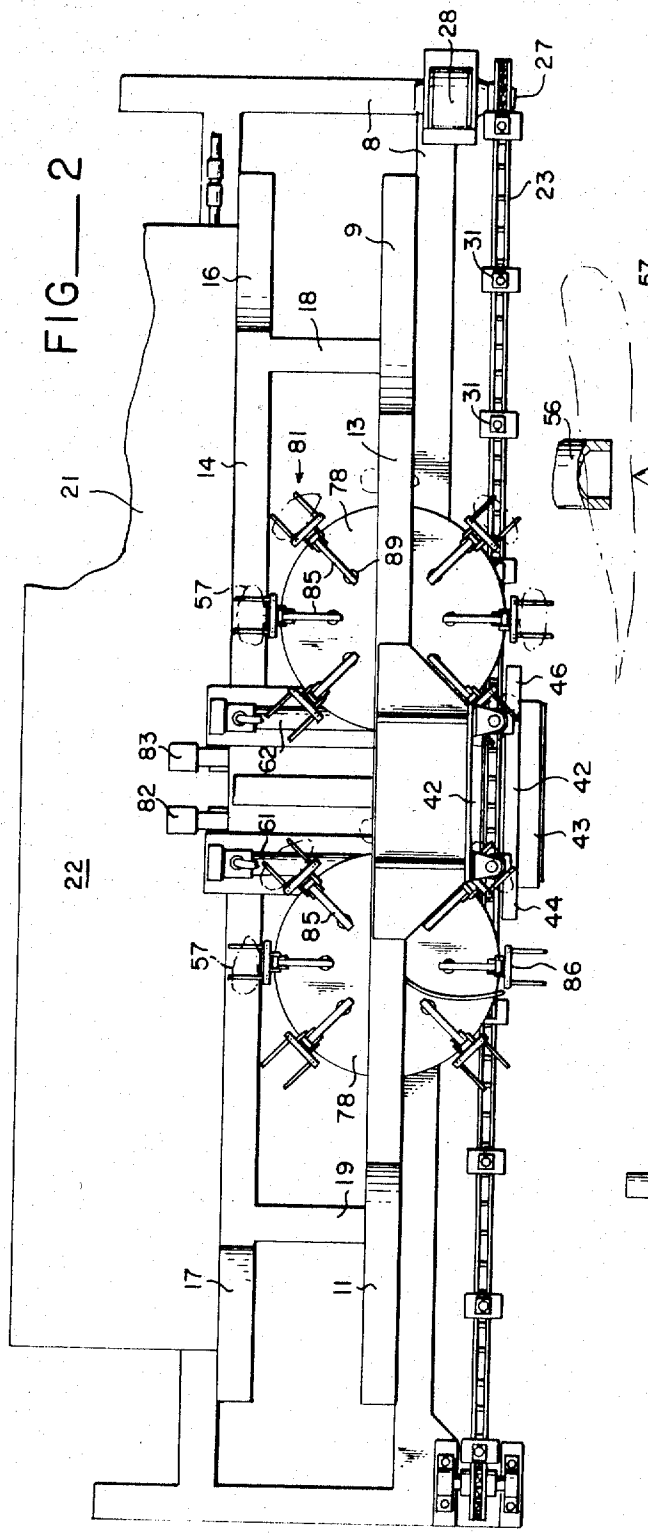


FIG. 3

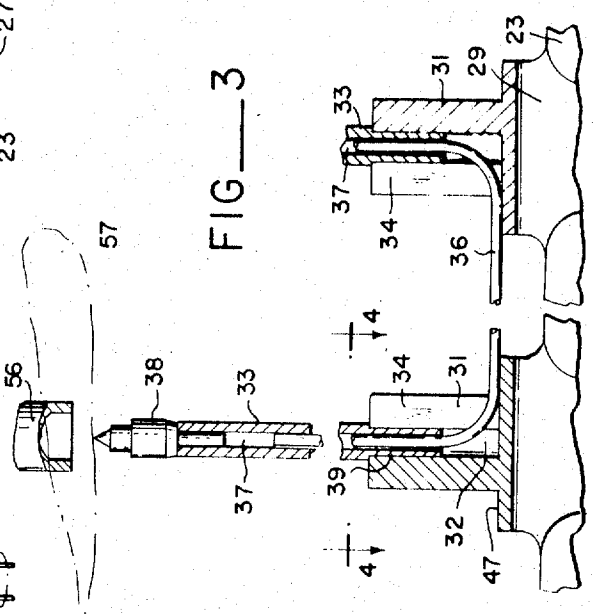


FIG. 4

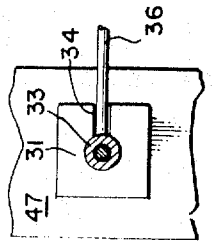
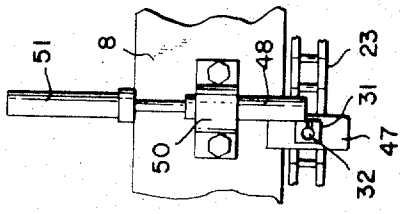


FIG. 5



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FIG. 7

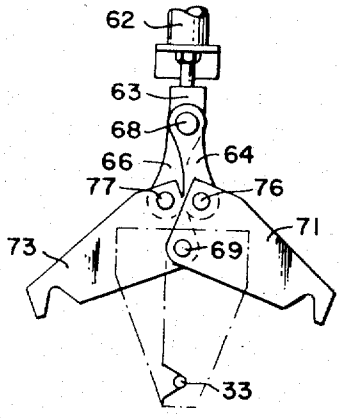
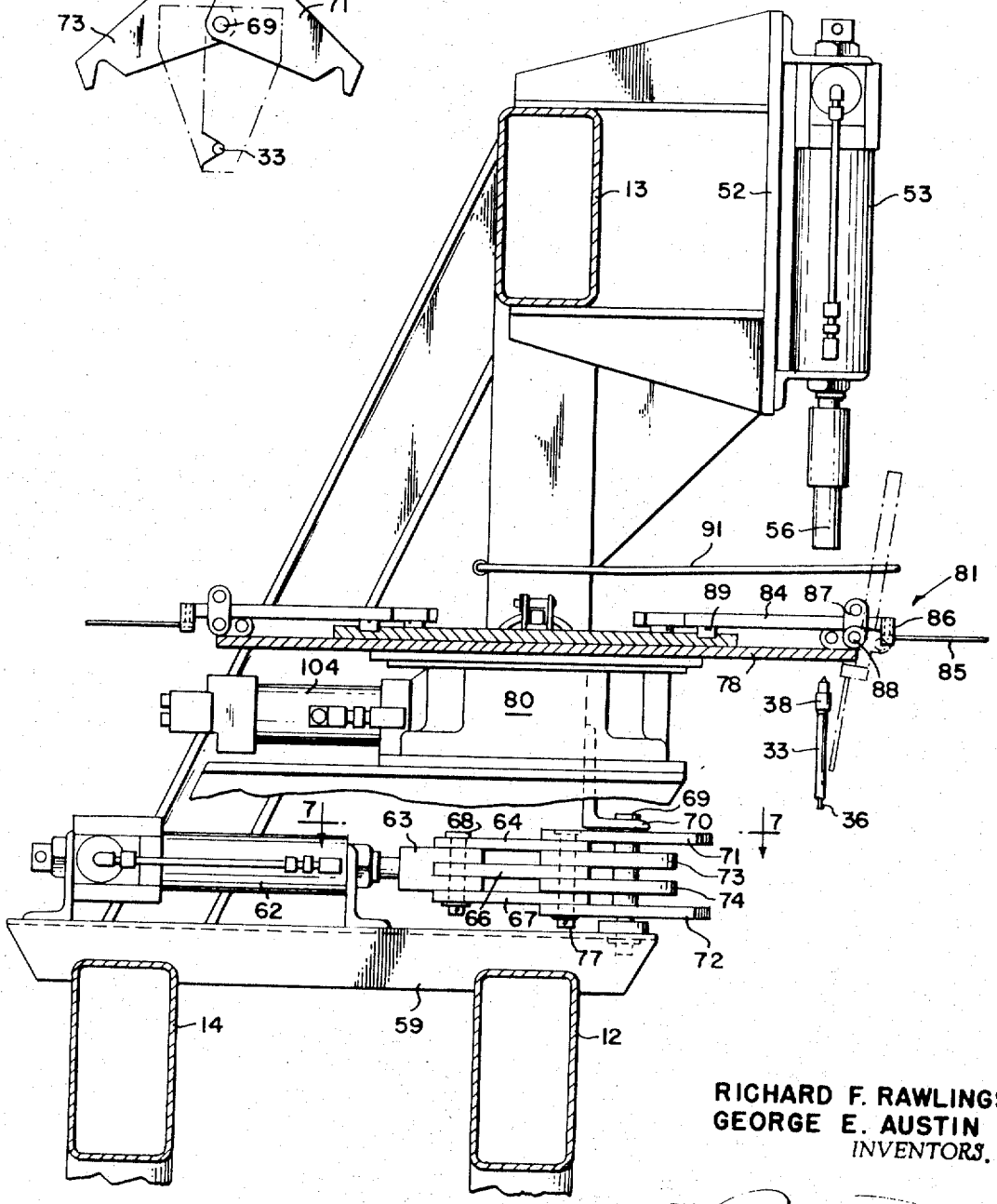


FIG. 6



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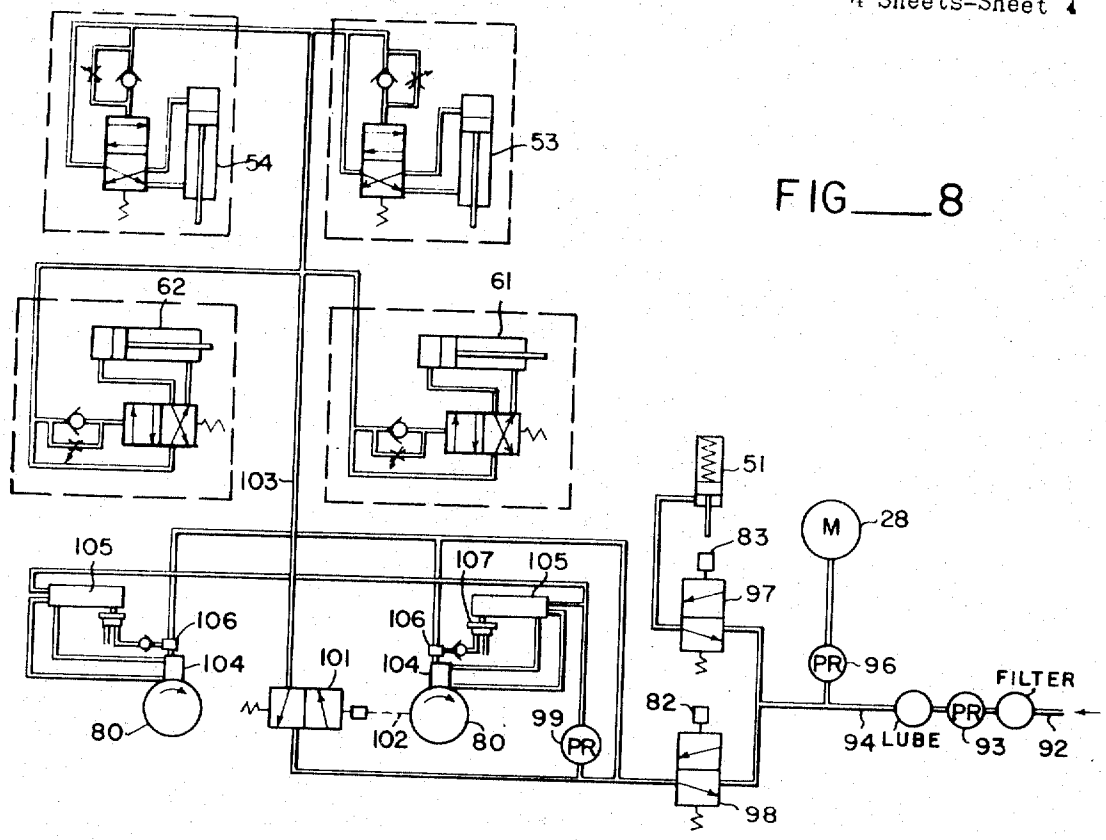
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FIG 8



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United States Patent Office

Re. 27,577
Reissued Feb. 6, 1973

27,577

SHELL STRINGER APPARATUS

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Original No. 3,431,803, dated Mar. 11, 1969, Ser. No. 576,635, Sept. 1, 1966. Application for reissue Feb. 12, 1971, Ser. No. 115,144

Int. Cl. B26d *7/06, 5/20*

U.S. Cl. 83—95 6 Claims

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

ABSTRACT OF THE DISCLOSURE

A shell stringing device for punching a hole in individual shells and stringing the shells onto a wire which is rigidly supported during the punching operation. The individual shells are automatically conveyed to the punching position over the wire, punched and strung onto the wire.

The present invention relates to apparatus for punching and stringing shells onto wire stringers and more particularly to a device for punching and stringing oyster sheels onto U-shaped wires which are then used in oyster seeding beds.

In commercial oyster production large numbers of old shells must be placed in the water for "seeding," i.e. providing a shell surface on which new oysters will attach themselves and begin their growth. It is customary to string the old shells on a wire approximately six feet long with half of the shells directed in one direction and the other half in the opposite direction, the strung shells being then hung over a beam or log in the water and allowed to seed. The average number of sheels per string is approximately 70 and hundreds of thousands of these strings are used for seeding depending upon the size of the operation. Thus, it is necessary to punch and string great quantities of shells. In the past, both the punching and the placing of the shell on the wire has been done entirely by hand which is a slow, expensive and tedious process. Because of the crude equipment utilized it has also been a somewhat risky operation since the shells must be held under a punch by hand while the hole is being made. The present invention provides apparatus for accomplishing the punching and stringing of sheels in an extremely rapid manner with the processing time for one string of shells being in the neighborhood of 35 seconds. The apparatus may be fed by a single operator who merely places the shells to be strung on movable indexing tables and the punching and stringing is done automatically.

The primary object of the present invention is therefore, to provide a shell punching and stringing apparatus which will automatically cycle to receive, convey, position, punch and string shells without the necessity of manual handling.

Another object of the present invention is to provide a shell punching and stringing apparatus of the character described which will rapidly and economically produce strings of shells with a minimum amount of attention from the operator.

These and other objects and advantages of the invention will be apparent from the following specification and appended claims and from the accompanying drawings wherein:

FIG. 1 is a rear elevational view of the apparatus;

FIG. 2 is a top plan view of the apparatus;

FIG. 3 is a partially sectioned elevational detail of the wire string holding means;

FIG. 4 is a cross sectional view taken along lines 4—4 of FIG. 3;

FIG. 5 is a plan view taken along lines 5—5 of FIG. 1;

FIG. 6 is a partially sectioned end elevation of the apparatus;

FIG. 7 is a plan view taken along lines 7—7 of FIG. 6; and

FIG. 8 is a schematic of the prenumatic system for the apparatus.

Referring to FIG. 1, the punching and stringing apparatus comprises generally a main support frame **1**, a string conveyor **2**, indexing tables **3** and **4**, clamping mechanisms **5** and **5a**, and punch units **6** and **7** which cooperate with the indexing tables **3** and **4** respectively.

Referring now to the details of the apparatus, the main support frame **1** includes a generally rectangular base **8** and a vertical A-frame which includes the legs **9** and **11** and the cross members **12** and **13**. On the front side of the vertical portion of the frame is a second vertical frame having a cross member **14**, which is parallel to the member **12**, and the legs **16** and **17** which are parallel to the legs **9** and **11**. The front vertical frame is spaced forwardly from the A-frame by means of the beams **18** and **19**. The parallel front and rear frames provide a means for supporting the various mechanisms presently to be described. In front of the rectangular frame, and supported by the base frame **8**, is a platform **21** suitable for supporting a standing operator whose station is indicated generally at **22**.

The string conveyor **2**, mounted at the rear of the main support frame comprises a conventional endless link chain **23** which passes above an idler sprocket **24** mounted at one side of the base frame and a drive sprocket **26** located at the opposite end of the frame which is driven by the output shaft **27** of an air motor **28** carried on the base frame. The motor **28** may be a standard vane type air motor or the equivalent which runs constantly and moves the chain **23** when it is released and maintains a constant tension of the chain when the chain is halted as will presently be described. At evenly spaced increments along the length of the chain **23** special links **29** are inserted and provide a mounting means for the lugs **31** shown in detail in FIGS. 3 and 4. The lugs **31** may be cylindrical in shape and each has a center opening or bore **32** for the reception of a wire holding rod **33**. In addition, adjacent pairs of lugs of the chain are provided with vertical slots **34** which face each other to enable a U-shaped wire string **36** to be received in the lug with its legs extending upwardly through the holes **37** in the rods **33**. This relationship is shown most clearly in FIG. 3.

The upper ends of the rods **33** are provided with tips **38** which are pointed so as to cooperate with the punch units in a manner to be described. The lower ends of the rods **33** have a reduced diameter portion **39** which is received in the holes **32** of the lugs providing a shoulder which engages the top face of the lug and receives the force of the blow when the shells are punched. This feature prevents the bottom ends of the rods from being damaged after long use and insures that they are not distorted so as to prevent their insertion within the lugs. As viewed in FIG. 1, the rods are mounted on the chain at one side of the apparatus and are conveyed by the chain from left to right to the punch position and then to a position to be removed once the shells are strung. The rods are mounted on the conveyor by merely inserting the legs of a U-shaped wire string **36** into two rods and then inserting the lower ends of the rods into adjacent lugs on the chain as shown in FIG. 3. The wire string is thus held upright ready to receive the shells which are punched and dropped down on the rods. The rods are then removed leaving the shells on the wire string.

The chain **23** may be guided in its travel by any desirable means such as the guide plates **41** which contact and support a portion of the lower run of the chain. The upper run of the chain is supported by means of the parallel plates **42** mounted on an extended portion of the frame **43**. Each of the plates **42** has inclined end portions **44** and **46** which contact transverse plates **47** mounted on the chain links in conjunction with the lugs **31**. Thus, as the chain travels from left to right in FIG. 1, the inclined portions **44** serve to guide the lugs **31** onto the plates **42** so that the lugs, rods and wires are actually supported by the plates **42** at the center of the top run of the chain in the area in which the punching is accomplished.

As previously mentioned, the air motor **28** keeps a constant tension on the chain **23** so that the chain moves when released and must be held in the stationary or stop condition. To accomplish this, a conveyor stop pin **48** is slidably mounted in the block **50** carried on the lower portion of the A-frame adjacent the conveyor chain. The stop pin **48** moves in a direction transverse to the direction of the travel of the chain and, when in the extended position shown in FIG. 5, is located so as to contact the oncoming lug **31** of the chain to stop and hold the chain. The pin **48** is extended and withdrawn by an air cylinder **51**. As will be explained in connection with the schematic shown in FIG. 8, the cylinder **51** normally holds the stop pin in the extended position by spring pressure and is pressure actuated to withdraw the pin. When a set of rods **33** moves toward the punch position, the conveyor chain is halted by the stop pin **48** and held in this position until a valve is operated to release the pin and to allow the chain to move.

As seen in FIG. 1, the pair of rods **33**, when in the punch position, are vertically aligned with the punch units **6** and **7** respectively. The punch units **6** and **7** may be mounted on a plate or the like **52** carried by the frame member **13**. The punch units **6** and **7** include the double acting cylinders **53** and **54** respectively. Except for their placement, the cylinders **53** and **54** may be identical and each will include a hollow punch member **56** fixed to its piston rod, with the opening in the hollow punch member being of a diameter slightly larger than the punch tip **38** on the rods **33** in order to allow the punch member to descend and pass over the tip thereby forming a hole in the shell. This action is shown in FIG. 3 which illustrates the shell **57** in dotted lines. The shell is carried downwardly by the force of the punch member **56** causing the tip **38** to pierce and punch a hole in the body of the shell. In order to insure removal of the punched portion of the shell from the top **56**, a blow hose **58** may be fitted to each punch member **56** as illustrated in FIG. 1 to provide a constant stream of air to clean the punch.

Since the upper ends of the rods **33** are unsupported and must be aligned fairly precisely with the downwardly driven punches **56**, clamping means indicated generally at **5** and **5a** in FIG. 1 and shown in detail in FIGS. 6 and 7 are provided. Each clamping means includes a separate double acting clamp actuating cylinder and a set of clamping arms which are identical in structure, only one of which will be described in detail. Referring to FIGS. 1 and 6, a transverse channel iron or the like **59** extends between the beams **12** and **14** to support the two clamp actuating cylinders **61** and **62** respectively as well as the associated clamping jaws. As shown in FIG. 6, the piston rod of the clamp cylinder is connected to a clevis **63** which provides a common pivotal attachment for the three vertically spaced links **64**, **66** and **67** on the pin **68**. Mounted to the rear of the pin **68** is a single pivot pin **69** having its ends mounted in an angle bracket **70** and the channel member **59**. Pivoted to the pins **69** are the upper and lower clamping arms **71** and **72** which form one side of the clamping device and the arms **73** and **74** spaced between the arms **71** and **72**. Each of these arms is notched adjacent its outer end as shown in FIG. 7 for

engaging the vertical rods **33** as shown in the dotted line position of the arms. In order to open and close the arms **71–74**, the links **64** and **67** are pivoted by a single pin **76** to one side of the arms **71**, **72** and the third link **66** is pivoted as at **77** to both the arms **73** and **74**. With this arrangement, it will be seen that extension and retraction of the piston rods of the cylinders **61** and **62** causes the clamping arms of the individual clamping units to engage the upper end of the rods **33** as shown in FIG. 7 to hold the rod in a fixed position during the punching operation. The cycle of operation of the various cylinders and indexing tables will be explained presently in connection with the schematic shown in FIG. 8.

The indexing tables **3** and **4** may be identical in structure and include a rotatable table top **78** and a standard rotary indexing unit **79** with the indexing unit being driven by separate double acting air cylinders. The details of the indexing tables form no part of the present invention and many different designs are available commercially. At least one of the indexing units will include cam means for positioning a two-way open and close air valve for controlling the operation of the punches and clamping means for each index position of the tables. The rotary indexing tables, double acting cylinders and valves are therefore shown schematically in FIG. 8. Both tables upon being actuated by the air cylinder will rotate simulaneously through a predetermined angular distance and hold the shells in position while they are punched. The angle through which the indexing tables rotate is determined in each case by the number of shell holding assemblies **81** mounted on the table top **78**. The table tops **78** may operate in the same or opposite directions and are fed with oyster shells from the operator's station **22**. Also at the operator's station are the foot pedal controls **82** and **83** the purpose of which will be presently described in connection with FIG. 8.

Each shell holding assembly **81** comprises a weighted counter balance arms **84** which is provided with shell holding fingers **85** on its outer end. The fingers may be carried on cross bars **86** fixed to the arms **84**. The fingers are preferably inserted into suitable holes in the bars and held by set screws or the like so as to be readily replaceable. The fingers and the arms are thus rigid and are pivoted to a short link **87** which, in turn, is pivotally connected as at **88** to the edge of the table top **78**. As shown in FIG. 2, the shells **57** are deposited by hand onto the fingers **85** by the operator standing at station **22** who also controls the operation of the index table. In order to allow the shell holding members **81** to accommodate the downward motion of the punch, the arms **84** are held in horizontal position by means of the permanent magnet **89** until the descending punch contacts the shell held by the fingers and moves it downwardly on the rod **33**. During this operation the fingers pivot downwardly and out of the way as shown in the dotted line portion of FIG. 6 to allow the indexing table to move the next increment. During its downward movement, the punch **56** moves the fingers **86** until the weighted arm **84** is passed the vertical as shown in FIG. 6 in which position it will remain until returned by the guide bar or bail **91** which serves to contact the arm **84** and return it to its horizontal position as the arm is rotated beyond the shell punching station. The magnet **89** holds the arm **84** in its horizontal position until the next punching operation.

Referring now to FIG. 8, a source of pneumatic pressure such as a compressor or the like supplied the inlet conduit **92** which may include a pressure regulator **93** to control the line pressure. The conduit **94** is connected directly to the motor **28** as previously described and in station **22** serves to selectively connect the line pressure supplied to the motor. A spring returned 2-way valve **97** which is operated by the foot pedal **83** at the operator station **22** serves to selectively ionnect the line pressure to the conveyor stop cylinder **51** such that, as long as

the foot pedal **83** is depressed, the stop pin **48** will be withdrawn to allow the conveyor to move. A second spring returned 2-way valve **98**, operated by the foot pedal **82** controls the admission of pressure from the line **94** to the double acting air cylinders of the table indexing units **80** through the pressure regulator **99**.

The operation of the clamp cylinders **61** and **62** and the punch cylinders **53** and **54** is controlled via the two-way valve **101** which is actuated by one of the indexing units **80**, the valve being spring returned as illustrated in FIG. 8. The one indexing unit **80** also includes a mechanical actuator **102** such as an actuating pin, cam means or the like acting between the indexing unit and the valve, whereby the valve is shifted when the table is indexed to move a shell beneath the punch. Rotary indexing units equipped with valve or switch actuators are well known in the prior art and commercially available in many designs, the details of which form no part of the present invention.

When the valve **101** is in the position indicated in FIG. 8, the line **103** is open to atmosphere and when the valve is actuated by indexing assembly **80** and actuator **102**, the line is subjected to pressure. The punches and the clamping mechanisms are, of course, operated simultaneously and, because of the position of the clamp cylinders **61** and **62** in the circuit as shown in FIG. 8, the clamp assemblies will actuate slightly ahead of the action of the punches. The double acting cylinders **53**, **54**, **61** and **62** are equipped with built in 4-way bleed pilot valves of known design whereby a single momentary pressure in the line **103** extends the piston rods their full stroke and immediately returns them to their original positions. Thus, with each indexing movement of the tables, the clamping means are actuated and returned and likewise the punches are actuated and returned.

In order to provide for continual cycling of the indexing assemblies **80** as long as pedal **82** is held depressed, these assemblies are provided with double acting air cylinders **104**, 4-way pilot timer valves **105** and 2-way valves **106** actuated by movement of the air cylinders, as shown schematically in FIG. 8. With this arrangement, and with the foot pedal **82** held depressed, air pressure will be first admitted to actuate the cylinders **104** to index the tables with the 2-way valves **106** being shifted by movement of the pistons of the associated air cylinder. Shifting of the valves **106** controls the pilot mechanisms **107** which cause the valves **105** to shift position to return the piston rods of the cylinders **104**. As the piston rods of the cylinders **104** return, the 2-way valves **106** are again shifted and the pilot mechanisms **107** will cause the valves **105** to reverse position again to actuate cylinders **104**. The cycle repeats as long as the foot pedal **82** is depressed. Each time the indexing table is moved, of course, the clamping mechanisms and the punches are actuated and thus the machine will continue to string shells as long as the foot pedal **82** is depressed and shells are deposited on the fingers **85** by the operator.

To operate the apparatus, an attendant keeps the conveyor belt **23** supplied with wire strings by mounting the U-shaped wire **36** in the rods **33** and placing them in the paired lugs as illustrated in FIG. 1. When the operator at station **22** desires to start a new string, the foot pedal **83** is operated to withdraw the stop pin **48** and allow the conveyor to advance a wire. As the wire string approaches the punch position, the foot pedal **83** is released to stop the conveyor thus positioning the rod **33**. The punching and stringing is accomplished by continually loading the support fingers **85** with oyster shells and depressing the foot pedal **82**. Each time the foot pedal **82** is depressed and released, the tables **3** and **4** will index one position to position a shell over both of the rods **33** ready for punching. As soon as the indexing table actuates the control valve **101**, the clamping cylinders **61** and **62** are actuated to hold the rods **33** in alignment and almost simultaneously, the punch cylinders **53** and **54** are actuated. As the punches descend, the shell is pushed down over the tip **38** of the rod **33** and allowed to fall. As this happens, the supporting fingers **85** are pivoted downwardly by the motion of the punch and, upon further indexing of the tables, these fingers are returned to their horizontal attitude as previously explained. The machine may, of course, be caused to continually cycle as previously explained. As soon as the operator has filled a string, the foot pedal **83** is again depressed allowing the completed string to move to the right as viewed in FIG. 1 to align the succeeding set of rods and wire string. The strung shells which are now on the rods **33** as illustrated are then lifted from the conveyor and the rods are merely slipped off of the wire leaving the shells strung loosely on the U-shaped wire. The end of the wire may then be crimped or bent so as to prevent removal of the shells and the string is complete.

From the foregoing, it will be apparent to those skilled in the art that the present invention provides new and useful improvements in shell punching and stringing apparatus of the character described. The arrangement and types of structural components utilized within this invention may be subjected to numerous modifications well within the purview of this invention and applicants intend only to be limited to a liberal interpretation of the specification and appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A shell stringing device for stringing shells on a wire-like stringer comprising in combination: means to mount said stringer in shell receiving position, stiffener rod means, means to support said rod means in association with said stringer, punch means for impacting a shell located over the end of said rod to force the shell over the rod and the stringer, said means to support said rod means being adapted to absorb the impact of said punch means transmitted through the rod releasable rod positioning means for engaging the rod to hold the rod in alignment with the punch means during operation thereof, and means for yieldably supporting shells in punching position over the end of said rod.

2. The combination according to claim **1** wherein: said stiffener rod means comprises a hollow rod adapted to telescope over said stringer.

3. The combination according to claim **2** wherein, said rod means includes a punch tip and said punch means includes a hollow punch element adapted to telescope over said punch tip, whereby a hole is punched in each shell as the shell is forced over the rod.

[4. The combination according to claim **3** wherein: said indexing means includes a rotary index table, said table having shell supporting assemblies spaced about the periphery thereof and disposed to be sequentially positioned above the rod as the table is indexed, said shell supporting assemblies being adapted to support a single shell, and mounting means connecting said assemblies to said table, said mounting means serving to move the assembly away from said punch means and the rod means as the shell is carried downwardly over the rod.]

5. The combination according to claim [4] *1* including: conveyor means, means to removably mount a plurality of said stringers and said rod means on the conveyor, and fixed support means beneath said conveyor and vertically aligned with the punch means providing support for the conveyor and rod means during the punching operation.

6. The device according to claim **1** wherein: said stringer is U-shaped, said rod means comprising first and second rod members telescoped over the respective ends of the legs of the stringer, said punch means including first and second punch mechanisms for simultaneously impacting shells located over the ends of said rod members, [said indexing means including first and second index mechanisms for simultaneous support and sequential

movement of shells into punching position over the ends of said rods.]

7. The combination according to claim 6 wherein: said rod positioning means includes first and second rod positioning means for simultaneously engaging the said rods to hold the rods in positive alignment with the associated punch mechanism during operation thereof.

[8. The combination according to claim 7 wherein: each of said index mechanisms comprises a rotary index table, said table having shell supporting assemblies spaced about the periphery thereof and disposed to be sequentially positioned above the associated rod as the table is indexed, said shell supporting assemblies being adapted to support a single shell, and mounting means connecting said assemblies to said table, said mounting means serving to move the assembly away from the associated punch mechanism and rod as the shell is carried downwardly over the rod.]

[9. The combination according to claim 8 including: conveyor means, means to removably mount a plurality of said stringers and associated rod members on the conveyor, and fixed support means beneath said conveyor and vertically aligned with the punch means providing support for the conveyor and rod members during the punching operation.]

[10. The combination according to claim 9 including: a control system for selectively controlling the operation of the device, said control system including first control means for actuating said index tables and second control means responsive to the indexing of said table for actuating said clamp means and said punch means simultaneously.]

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FRANK T. YOST, Primary Examiner

U.S. Cl. X.R.

29—241, 433; 83—267, 925 R