July 10, 1956 O. CONRAD 2,753,897

DEVICE FOR ASSEMBLING FRAMED SCREENS

Filed Dec. 1, 1952 7 Sheets-Sheet 1

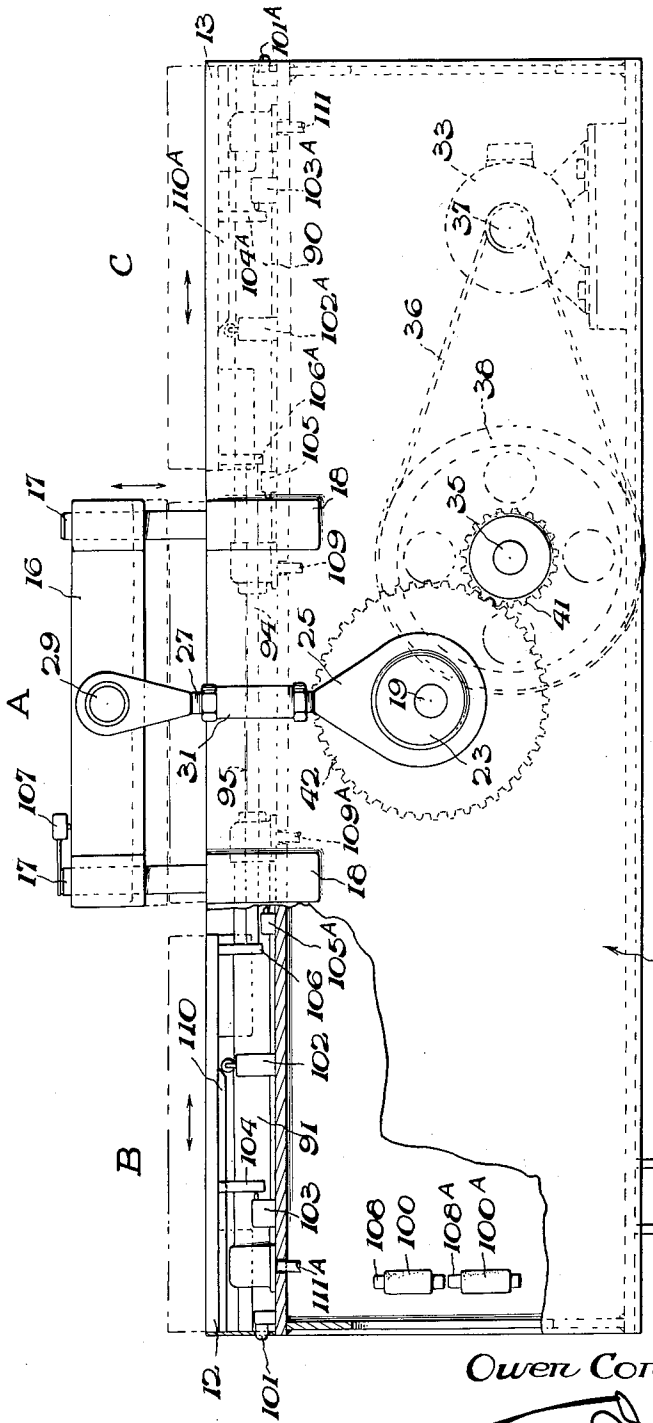


Fig. 1.

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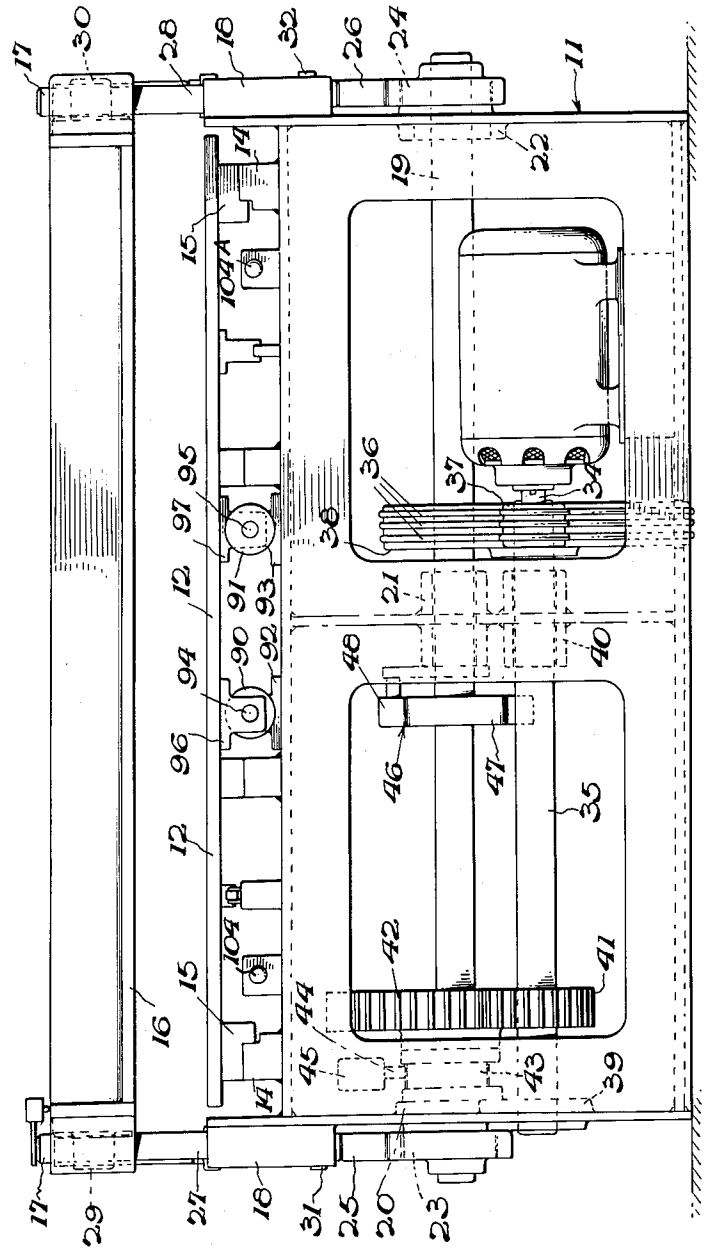


Fig. 2.

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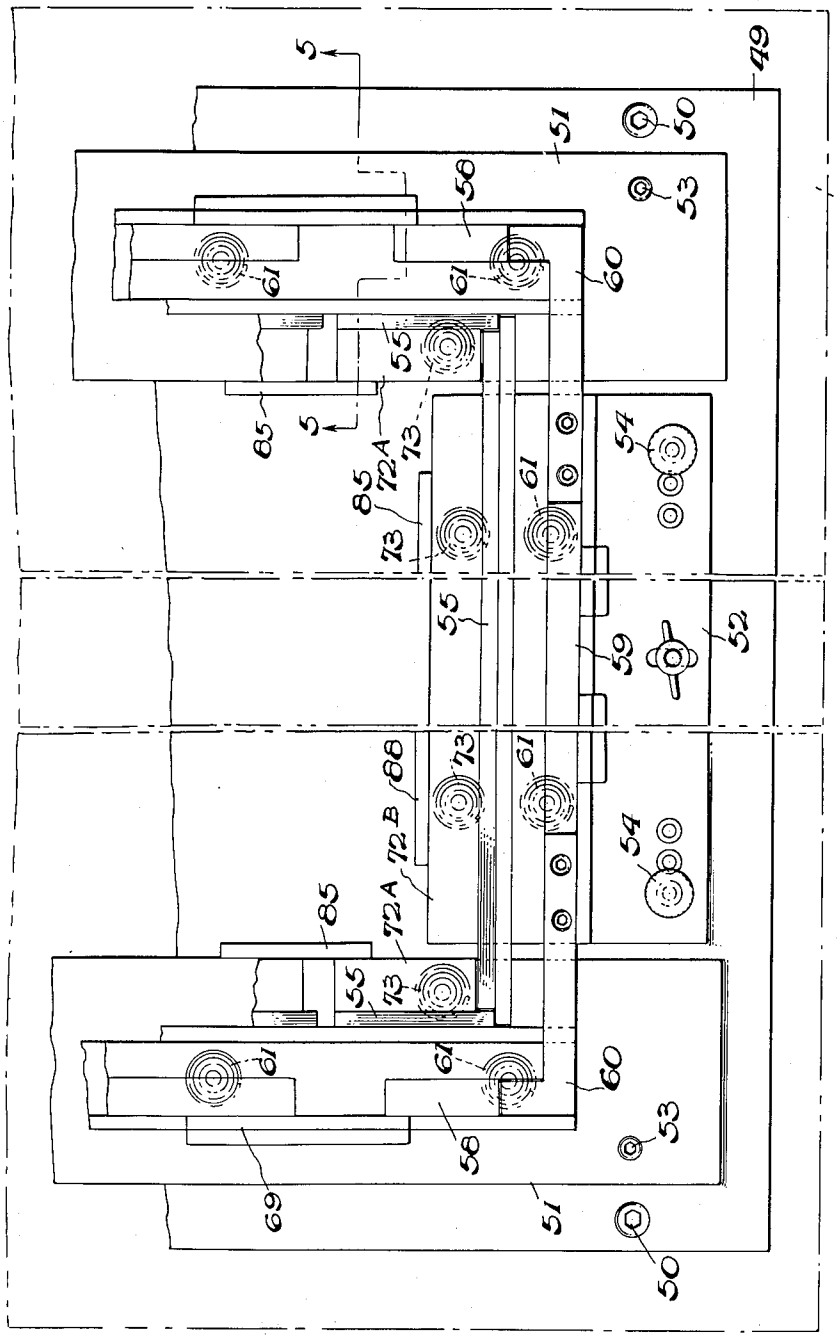


Fig. 3.

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Fig. 4A.

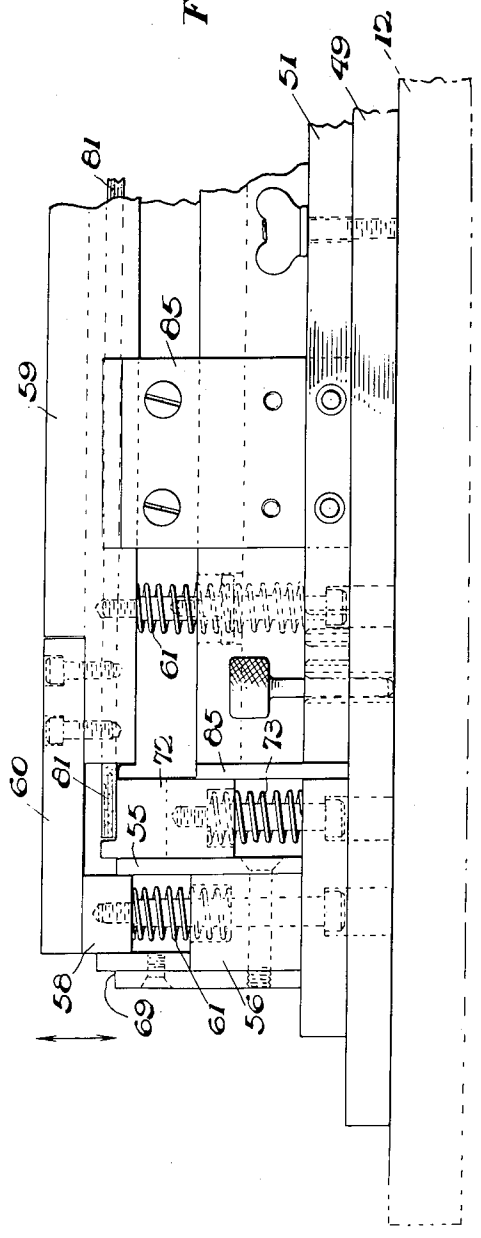
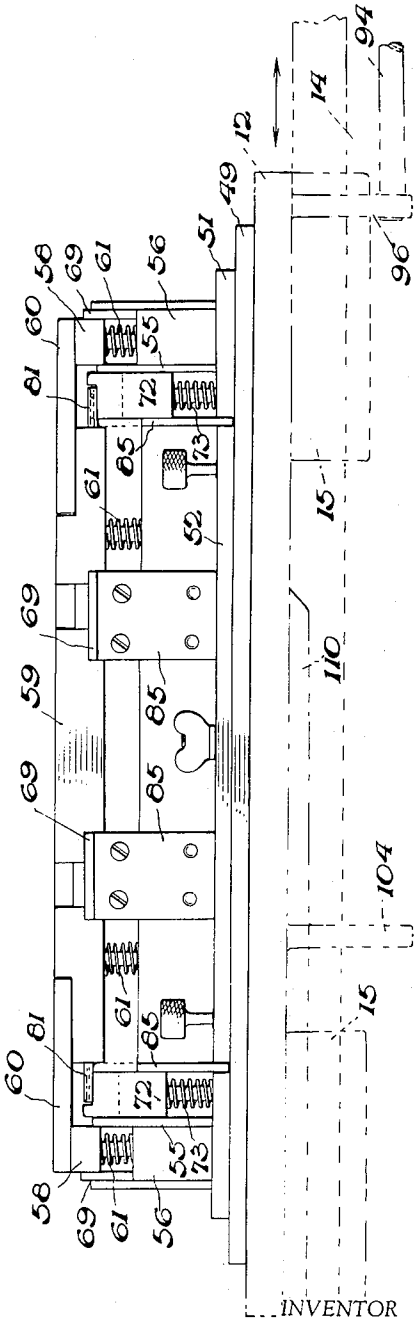


Fig. 4.



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Fig. 5.

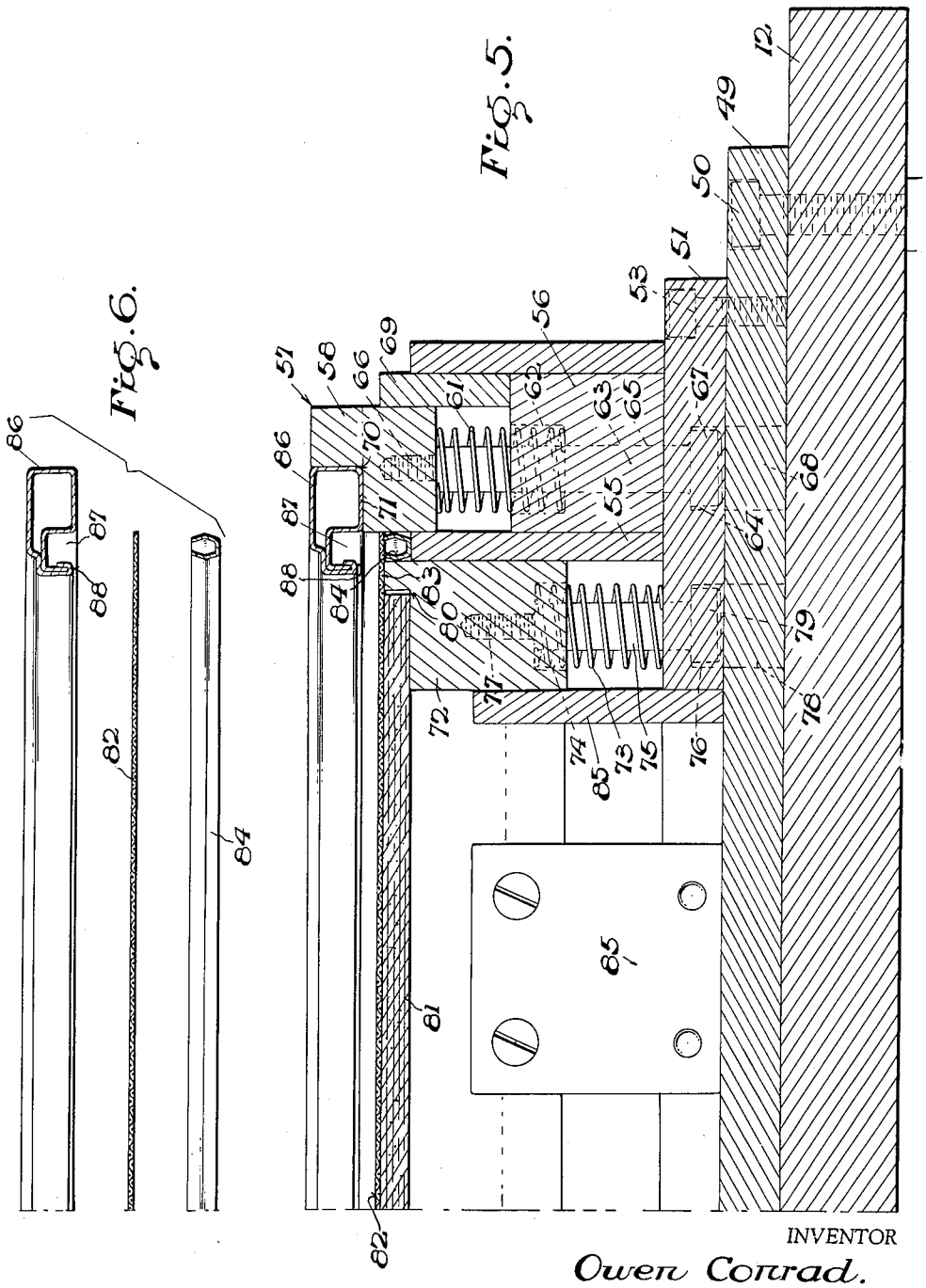


Fig. 6.

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Fig. 8.

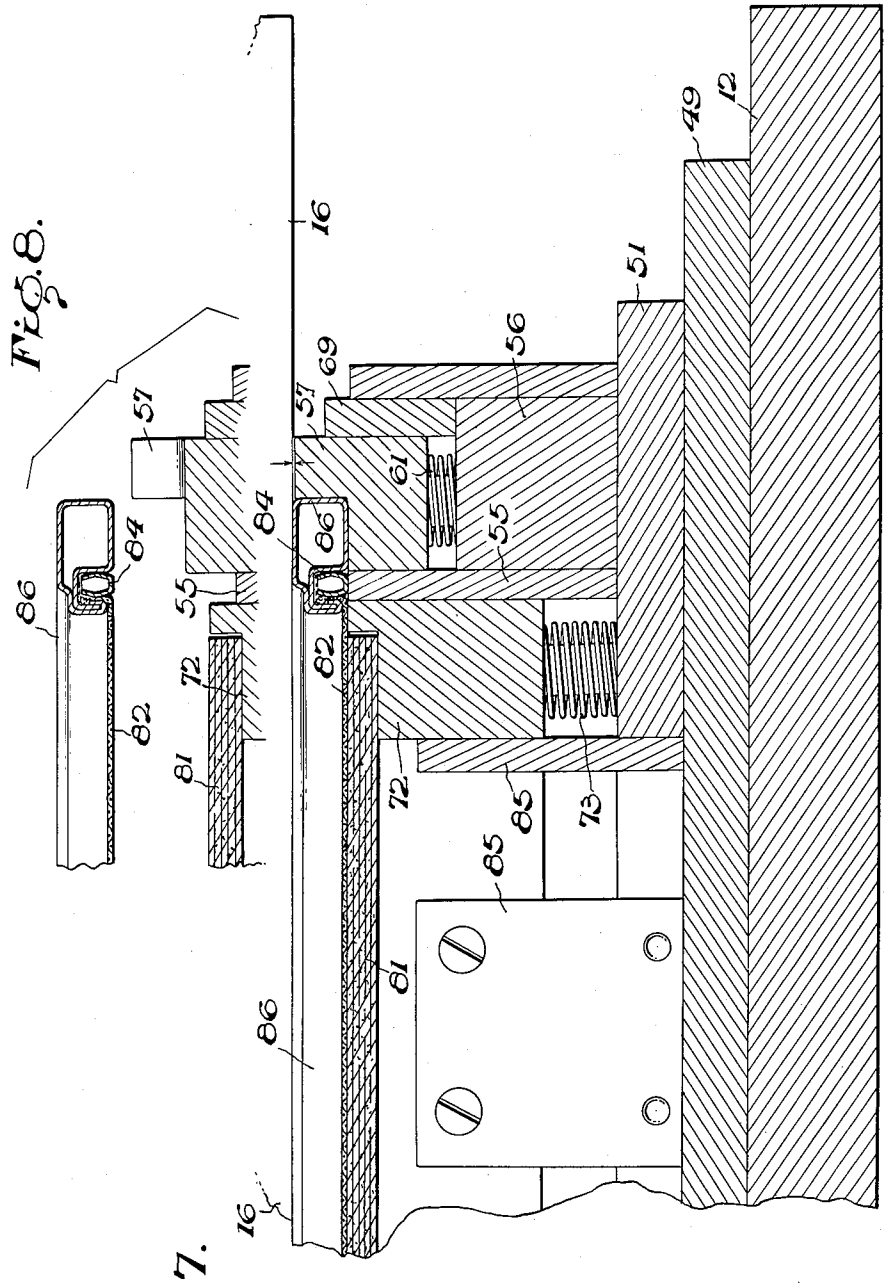


Fig. 7.

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DEVICE FOR ASSEMBLING FRAMED SCREENS

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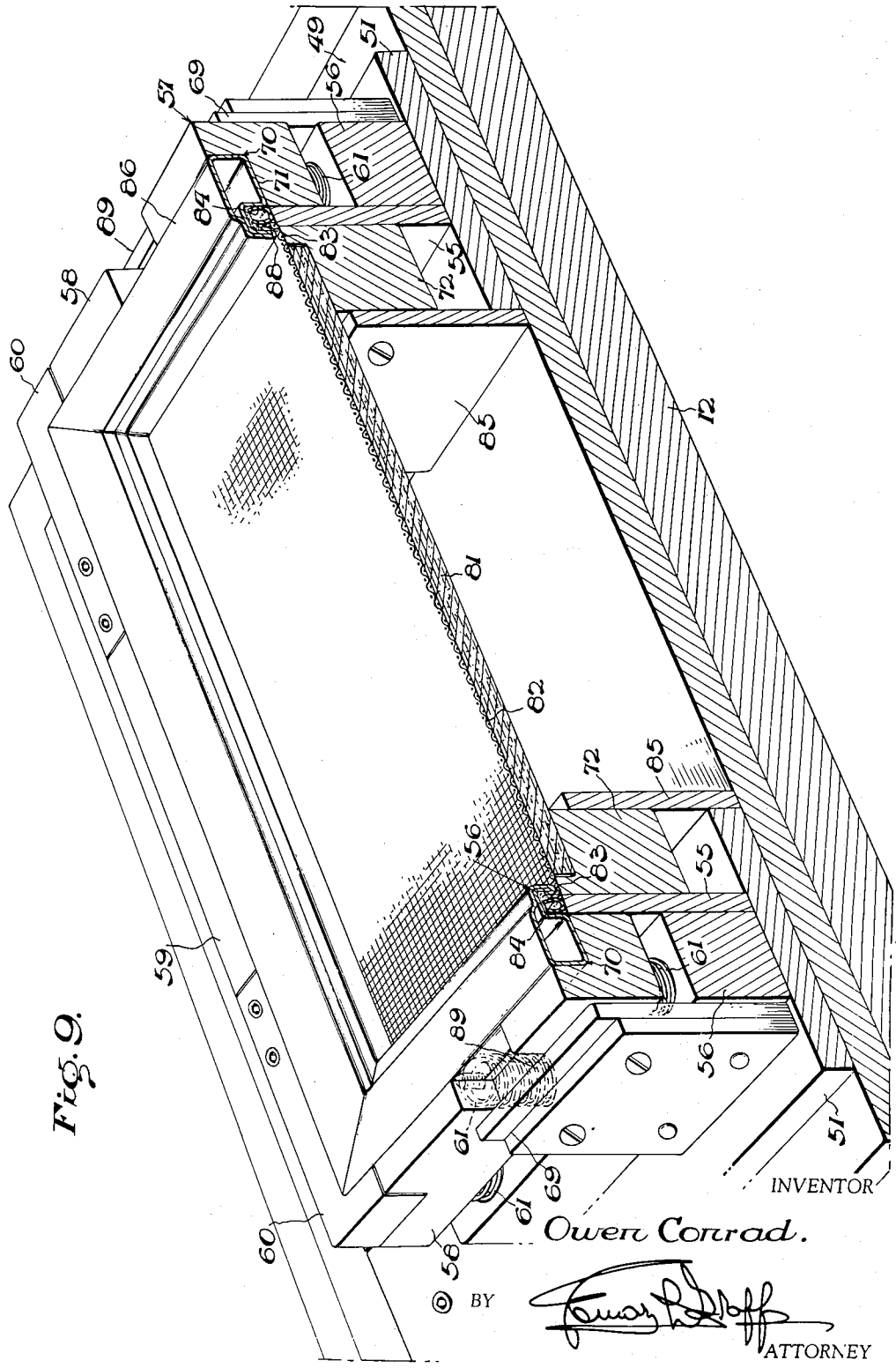


Fig. 9.

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2,753,897

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2,753,897

DEVICE FOR ASSEMBLING FRAMED SCREENS

Owen Conrad, Miami, Fla., assignor to American Screen Products Company, a corporation of Florida

Application December 1, 1952, Serial No. 323,401

8 Claims. (Cl. 140—109)

This invention relates to framed screens and is more particularly concerned with assembly machines for use in securing the screening to the frame with splines set into grooves.

More particularly, the invention is designed to facilitate the assembly of preformed members which, when properly united, form a framed insert screen. These members consist of a grooved frame, a sheet of screening, and splines. The screening is fastened to the frame by bending its edges down into the grooves surrounding the inner perimeter of the frame and then forcing the splines into the grooves. In accordance with conventional practice, such screens are assembled by laying the frame, grooves up, flat on the table, placing a precut sheet of screening on top of the frame, turning the edges of the screening into the groove by rolling a hand tool along the groove and then driving home each spline in turn with a hammer. The quality of the finished product depends largely upon the skill and care exercised by the workman. Moreover, this hand method of assembly, makes it difficult to produce a high quality finished product due to the fact that the splines are hammered in one at a time so that uniform tensioning of the screen over its entire area in all directions is not usually obtained, even by very skilled persons.

One of the objects of the present invention is the provision of a machine for use in assembling framed screens of the type mentioned which results in superior and uniform quality of finished product and which, moreover, can be operated by relatively unskilled persons.

Another object of the invention is the provision of such a machine which reduces the time necessary to make the assembly, increases the productive output of each worker, decreases unit cost, and improves working conditions by eliminating or reducing noise and physical exertion on the part of the operators.

Further objects and advantages of this invention will appear from the following description considered together with the accompanying drawing.

In the drawing:

Fig. 1 is a side elevational view of an embodiment of the invention.

Fig. 2 is an end elevational view of the same embodiment.

Fig. 3 is a plan view of the embodiment, partly broken away.

Fig. 4 is a side elevational view of one of the tables.

Fig. 4(*a*) is an enlarged fragmentary portion, partly in section, of the table shown in Fig. 4.

Fig. 5 is a section along the line 5—5 of Fig. 3, showing the position of the screen frame members before assembly.

Fig. 6 is a view of the screen frame members as shown in Fig. 5, apart from the assembly machine, and in spaced relation to each other.

Fig. 7 is a view similar to Fig. 5 showing the screen frame members in assembled position under the influence of the pressure platen.

Fig. 8 is a fragmentary view showing the assembled screen and assembly machine elements as the assembled screen is discharged from the machine.

Fig. 9 is a perspective view of a longitudinal portion of one of the assembly tables.

Referring with more particularity to the drawing in which like numerals designate like parts, the embodiment illustrated comprises a rectangular, box-like, frame structure, designated generally by the numeral **11**. The device as a whole has three principal sections, namely, the center section A, and two end sections B and C, respectively.

The end sections are provided with tables **12** and **13**, respectively, which are slidably mounted on parallel longitudinal tracks **14** secured on top of the frame **11**. Rabbeted cleats **15** are secured to the bottom of the table **12**, similar cleats to the bottom of the table **13**, and they slidably engage the tracks **14**, substantially as shown, thereby providing a space between the bottom of the tables and top of the frame **11**.

The tables are adapted to reciprocate horizontally on the tracks between their respective end sections and the center section A.

The center section is provided with a pressure platen **16** which is vertically reciprocated on four posts **17**. These posts are secured to and project upwardly from suitable brackets **18** attached to the side of the frame structure **11**. Vertical reciprocation of the pressure platen **16** is effected by a camming arrangement comprising a transverse cam shaft **19** rotatably mounted in bearings **20**, **21** and **22** on the frame structure **11**. A pair of circular cams **23** and **24** are eccentrically secured to the ends of the shaft and are rotatably engaged with eccentric straps **25** and **26**, respectively. Each strap is carried at one end of an eccentric rod **27** and **28**, the other end of the rods being pivotally journaled to pins **29** and **30** projecting laterally from the platen **16**. Consequently, rotation of the shaft **19** results in the vertical reciprocation of the platen. The rods **27** and **28** are each made adjustable in length by means of adjustable joints **31** and **32**, respectively.

Rotation of the cam shaft **19** is effected by an electric motor **33** or other suitable source of power, having a take-off shaft **34** geared to a counter-shaft **35** by means of belts **36** and pulleys **37** and **38**. The counter-shaft is mounted in frame bearings **39** and **40** and carries for constant rotation therewith an intermediate gear **41** which is constantly in mesh with a driven gear **42**. The latter gear is rotatably mounted on the cam shaft **19**. The gear **42** and shaft **19** are selectively engageable for corotation by means of a clutch **43** mounted on the shaft **19** controlled by an arm **44**. The arm may be operated by any suitable means, such as a solenoid **45**. The shaft **19** may also be provided with a dash pot in the form of a drag brake **46** to stop rotation of the cam shaft under its own momentum when the clutch is released and comprises a brake drum **47** on the shaft and a brake band **48** in engagement with the drum.

Each table **12** and **13** carries a unit for supporting the screen frame elements and the sheet of screening prior to and during assembly under the force of the pressure platen. Each of these units comprises a base member **49** secured to the table by bolts **50** or any other suitable means. Secure on top of the base member **49** are end strips **51** and side strips **52** with bolts **53** and **54**, respectively. A vertical wall **55** is mounted on the strips **51** and **52** and extends around the sides and ends thereof in the form of a rectangle. Adjacent the outer sides of the wall **55** there is secured rectangular shelf **56**, the top of which is below the top of the wall **55**. The shelf **56** supports an outer floating frame carrier **57** consisting of members **58** at the ends and **59** at the sides, said members

being connected together by corner pieces or flat angles **60**.

Coil springs **61** floatingly support the carrier **57** on the shelf **56**. The lower ends of the springs **61** are held in cylindrical recesses **62** at the top of the said shelf, the upper ends of said springs abutting the bottom of the floating carrier **57**. Bolts **63** project upwardly through vertical countersunk apertures **64** in the strips **51** and **52** and apertures **65** of the shelf. The upper ends of the bolts have each a reduced threaded section **66** which is screwed into the bottom of the carrier **57**. Accordingly, as the carrier moves downwardly, the bolts slide through the apertures **64** and **65** until the head **67** on the bottom of the bolts contacts the top of the table, an aperture **68** being provided through the base member **49** to accommodate each bolt head during this movement.

Outer abutment plates **69** are secured to the shelf **56** and project upwardly in slidable engagement with the floating carrier **57** to assist in holding it in proper position.

The upper inside corners of the floating carrier **57** are rabbeted to provide a continuous rectangular recess **70** of L-shaped section for supporting the frame of the screen to be assembled. The horizontal ledge **71** of the recess is, in its normal position, above the top edge of the wall **55**.

On the inner side of the wall **55**, another floating carrier **72**, comprising end members **72A** and side members **72B** is provided on coil springs **73**. The upper ends of the springs **73** are carried in recesses **74** at the bottom of the carrier **72** and the lower end of the springs rest on top of the stationary frame **51**. Bolts **75** pass upwardly through countersunk apertures **76** in the strips **51** and **52**, through the coil springs **73** and are secured to the movable inner floating carrier **72** by means of a reduced threaded portion **77** at the upper end. Apertures **78** are provided through the base member **49** to accommodate the heads **79** of the bolts which function in a manner similar to the bolts **63**, hereinabove described.

The carrier **72** is also rabbeted at the inside corner to provide a recess **80** which supports a sheet **81** of thin plywood or other suitable material, such as Masonite, and which, in turn, supports the screening **82** to be assembled with the screen frame.

The top edge **83** of the carrier **72** projects upwardly above the top edge of the wall **55** an amount substantially equal to the thickness of the spline **84** that are to form part of the assembled screen and the thickness of the wall is substantially equal to the width of the splines.

Inner abutment plates **85** are attached to the inside of the strips **51** and **52** and they project upwardly to slidably engage the inner carrier **72** and help hold it in proper position.

The screen parts to be assembled consist of the usual rectangular frame **86** formed with channels **87** on one face at the inner perimeter for receiving the border edges of the sheet of screening **82** and splines **84** which are tightly wedged into the channels and hold the screening in place. In making the assembly with the device hereinabove described, the splines **84** are first placed on top of the wall **55** between the vertically movable floating carriers **57** and **72**. The screening **82**, cut to the proper size, is then placed on the sheet **81** and over the splines the edges thereof extending to the outer floating carrier **57**. The screen frame **86**, is then placed above the sheet of screening and supported in the rabbeted recess **70** of the outer floating carrier **57**.

The entire table is then moved along the tracks **14** to the center section A of the device until it is directly beneath the platen **16** at which time the clutch **43** is actuated to rotatably connect the shaft **19** with the driven gear **42**, thereby causing the platen to move downwardly. Under the pressure of the platen, the border edges of the sheet of screening **82** and the splines **84** are forced into the channels **87**, as shown in Fig. 7, the floating carriers **57** and **72** yielding under the pressure. By this action, the screening **82** is pulled taut in both horizontal directions, simultaneously, and is prevented from being distorted in a vertical direction due to the fact that the inner lip **88** of the channel is directly above and bears against the inner floating carrier **72**.

The platen then moves upward and the table is returned to its original loading position, whereupon the assembled screen is removed and the table reloaded for the next assembly. Slots **89** are provided in the outer floating carrier **57** to facilitate the manual placing of the frame element **86** and the removal of the assembled frame.

The operation of the device is preferably so arranged that as one of the tables **12** or **13** is being loaded for assembly, the other table, already loaded, is moving under the platen. In other words, the cycle of operation of the two tables should be synchronized to conserve as much time as possible.

Although the tables may be moved on the tracks to and from the center section manually, they may also be moved mechanically, if desired. One means for doing this is by the use of hydraulic jacks **90** and **91**, one for each table **12** and **13**, respectively. These jacks are secured by footplates **92** and **93** to the top of the frame structure **11** below the tables **12** and **13**, and the ends of the piston rods **94** and **95** are secured to brackets **96** and **97** on the bottom of the opposite table. Pipe lines **98** and **99** from a source of fluid under pressure (not shown) are connected to the ends of the cylinders of the jacks through suitable 4-way control valves **100** and **100A**.

The actuation of said jacks may, furthermore, be automatically synchronized, if desired, with each other and with the vertical movement of the platen by a suitable electrical circuit, containing starting switches **101** and **101A**, limit switches **102** and **102A**, microswitches **103** and **103A** operated by fingers **104** and **104A** carried by the movable tables, and microswitches **105** and **105A** operated by members **106** and **106A** attached to the tables in opposite relation. A microswitch **107** on top of one of the platen posts **17** would be contacted by the platen at the limit of its upward travel. The hydraulic valves would be operated by solenoids **108** and **108A**. These electrical elements may be connected in an electrical circuit, if automatic synchronized action is desired, to function as follows: To start the cycle of operation with the table **12**, for example, the starting switch **10** which controls the hydraulic circuit, would be first closed to energize the solenoid **108** on the four-way valve **100**, thereby releasing the flow of oil into the return end **109** of the hydraulic jack cylinder **90** and causing its piston rod **94**, connected to the table **12**, to move to the center section A under the platen. As the table begins moving toward the center of the machine, a cam **110** attached thereto contacts its corresponding limit switch **102** and thereby neutralizes the entire electrical and hydraulic circuit of the opposite table **13**. When the table **12** has thus been set in motion and it reaches its proper position at the center section A, the finger **106** contacts its corresponding microswitch **105**, deenergizing solenoid **108** and thus neutralizing the hydraulic valve **100**. At the same time, the clutch solenoid **45** is energized to bring into action the clutch **43** and cause the shaft **19** to rotate for one revolution, whereby the action of the cams brings the platen down and then returns it to the top, its original position, where contact is made with the microswitch **107**. Actuation of the latter neutralizes the solenoid **108** on the four-way valve **100** and energizes the solenoid **108A** on the other four-way valve **100A**, thereby releasing hydraulic pressure on the extension end **111** of the hydraulic cylinder **90** to return the table **12** to its original loading position. As the table moves into this position, the finger **104** contacts the microswitch **103** which de-energizes the solenoid **108** together with its operating current and energizes the solenoid **108A**. Also the limit switch **102** is released from the cam **110** permitting the circuit for the table **13** to become operational and pass through a similar cycle, this cycle being started by the energizing of the solenoid **108A**

to operate the valve 100A and start the table 13 moving to the center section.

When a table returns to its original loading position after passing through this cycle of operations, the operator removes the completed screen. In the meantime, the operator at the other table has placed the screen parts thereon in preparation of the next cycle of operations.

I claim:

1. A device for assembling elements of framed screens, said elements consisting of a frame having grooves on a face thereof, a sheet of screening, and splines adapted to be disposed in the grooves of the frame together with border edges of the screening; said device comprising a table; a rigid structure for supporting said table; said table being slidable over said structure between a loading station and an assembly station; a member carried by the table for rigidly supporting said splines; a first floating carrier on said table extending above said member, for yieldably supporting said sheet of screening; a second floating carrier on said table extending above said first floating carrier, for yieldably supporting said frame; and a vertically reciprocatable platen above said table at said assembly station for applying pressure downwardly on said frame and carriers.

2. A device for assembling elements of framed screens, said elements consisting of a frame having grooves on a face thereof, a sheet of screening, and splines adapted to be disposed in the grooves of the frame together with border edges of the screening; said device comprising a table; a rigid structure for supporting said table; said table being slidable over said structure between a loading station and an assembly station; means for moving said table between said stations; a member carried by the table for rigidly supporting said splines; a first floating carrier on said table extending above said member, for yieldably supporting said sheet of screening; a second floating carrier on said table extending above said first floating carrier, for yieldably supporting said frame; and a vertically reciprocatable platen above said table at said assembly station for applying pressure downwardly on said frame and carriers.

3. A device for assembling elements of framed screens, said elements consisting of a frame having grooves on a face thereof, a sheet of screening, and splines adapted to be disposed in the grooves of the frame together with border edges of the screening, said device comprising a horizontal trackway extending from a loading station to an assembly station, a table slidably mounted on said trackway for movement between said stations, a member carried by the table for rigidly supporting said splines; a first floating carrier on said table extending above said member, for yieldably supporting said sheet of screening; a second floating carrier on said table extending above said first floating carrier, for yieldably supporting said frame; and a vertically reciprocatable platen above said table at said assembly station for applying pressure downwardly on said frame and carriers.

4. A device for assembling the elements of framed screens, said elements consisting of a frame having grooves on a face thereof, a sheet of screening, and splines adapted to be disposed in the grooves of the frame together with border edges of the screening, said device comprising a table, a member carried by the table for rigidly supporting said splines; a first floating carrier on said table extending above said member, for yieldably supporting said sheet of screening, and a second floating carrier on said table extending above said first floating carrier, for yieldably supporting said frame, whereby said elements, when positioned on said member and carriers can be assembled by pressing downwardly on said frames.

5. A device as defined by claim 4 in which the carriers are supported on coil springs disposed between each of them and the table.

6. A device as defined by claim 4 in which the floating carriers are disposed adjacent the member and on either side thereof to form a trench for the splines.

7. A device as defined by claim 4 having abutment means between the table and the floating carriers to limit the relative movement thereof.

8. A device as defined by claim 4 in which the second floating carrier is provided with lateral abutments for the outer edges of the frame.

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