Oct. 6, 1953 F. C. RUSSELL ET AL 2,654,402

APPARATUS FOR PLACING SPLINES

Filed Dec. 8, 1947 2 Sheets-Sheet 1

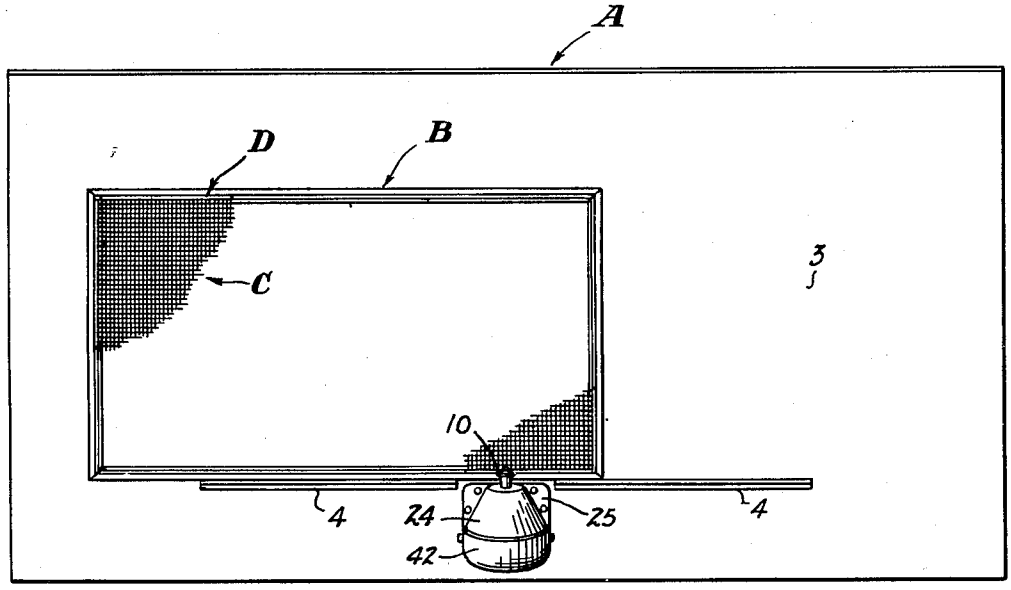


Fig. 1

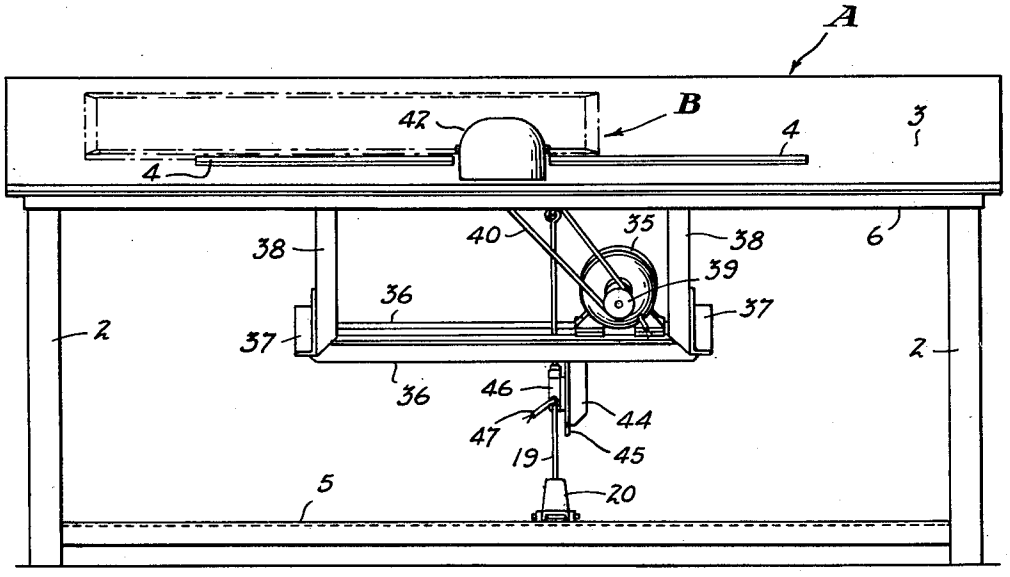


Fig. 2

INVENTORS
Frank C. Russell
Charles W. Porter
BY
Evans & McCoy
ATTORNEYS

Oct. 6, 1953 F. C. RUSSELL ET AL 2,654,402

APPARATUS FOR PLACING SPLINES

Filed Dec. 8, 1947 2 Sheets-Sheet 2

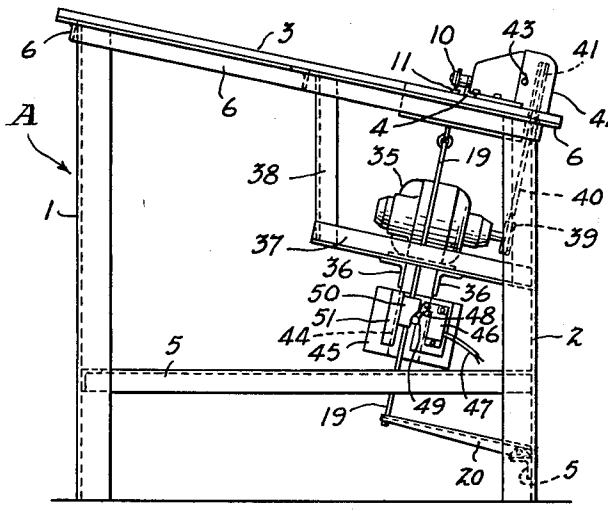


Fig. 3

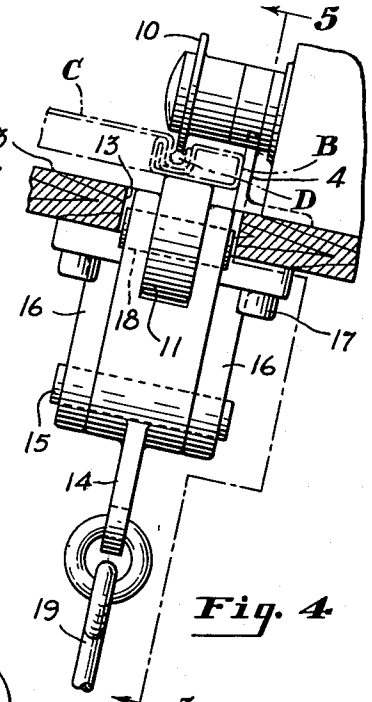


Fig. 4

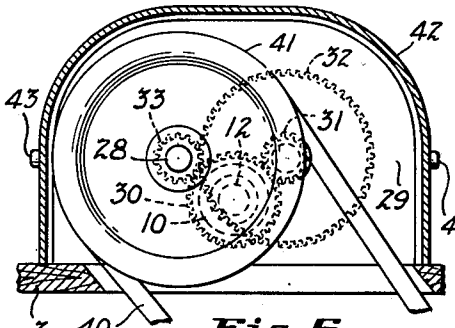


Fig. 6

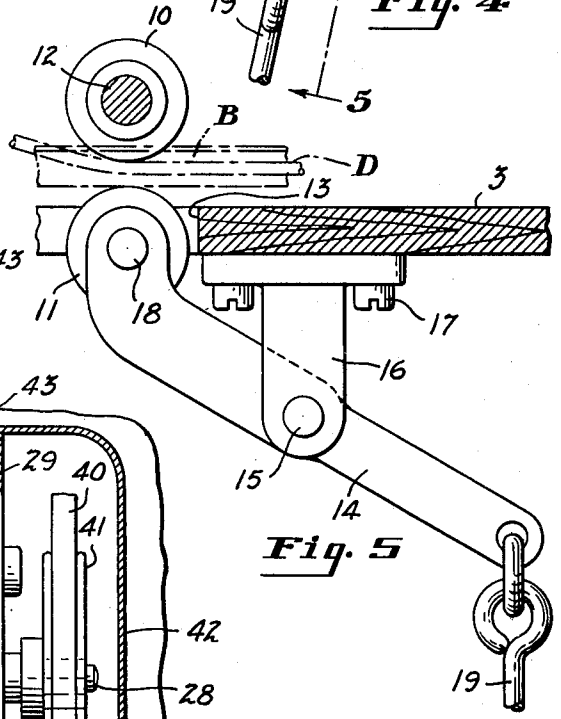


Fig. 5

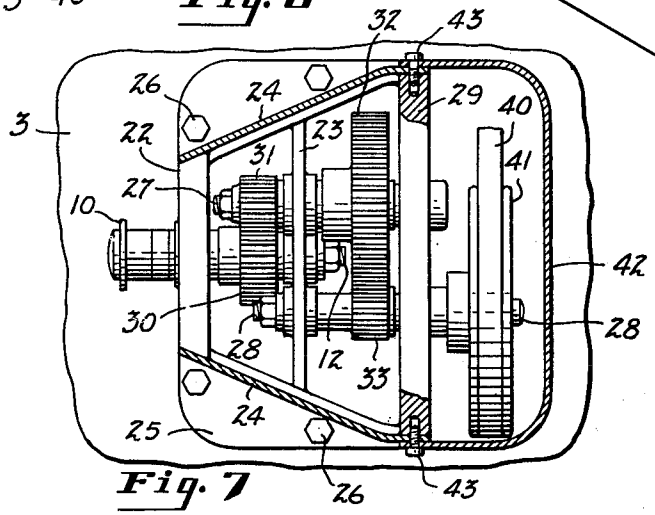


Fig. 7

INVENTORS
Frank C. Russell
Charles W. Porter
BY
Evans & McCoy
ATTORNEYS

Patented Oct. 6, 1953 2,654,402

UNITED STATES PATENT OFFICE

2,654,402

APPARATUS FOR PLACING SPLINES

Frank C. Russell, Cleveland, and Charles W. Porter, Fairview Village, Ohio, assignors to The F. C. Russell Company, Cleveland, Ohio, a corporation of Ohio

Application December 8, 1947, Serial No. 790,296

11 Claims. (Cl. 140—109)

1

This invention relates to the placing of splines in grooved or channeled frames and more particularly to the placing of such splines in a continuous or progressive manner such as in the assembling of window screens and the like.

The art of assembling window screen inserts and glass lights in frames for use as window and door inserts has frequently resorted to the use of splines that are pressed into grooves formed in the frames and held in place by the expansive force exerted by the splines or by an interlocking arrangement between the splines and the frame members. Difficulties have been experienced in pressing splines into frame grooves because of variable factors encountered, such as dimensional differences arising out of manufacturing tolerances, frictional characteristics of splines made out of different materials and human factors involved in manual methods of assembly. Such difficulties and others not specifically mentioned have been encountered particularly in the assembling of window screens of the type having grooved metal frames to which flexible screening material is attached by a flexible and deformable spline that is pressed into the groove of the frame with the screening material interposed therebetween.

The principal object of the invention is therefore to provide an apparatus for inserting or placing splines into the grooves of frames, more particularly to provide such a method and apparatus for inserting flexible splines in frame grooves in a progressive substantially continuous operation.

Other objects are concerned with the provision of a spline inserting apparatus wherein the movement of the frame and spline during the progressive operation is effected by frictional engagement between an operating tool and the spline.

Another object is to provide a spline pressing or placing device employing relatively movable members for forcing a spline into a frame groove in which: one or both of the members is a roller; the roller is motor driven so that it effects translation of the frame and spline assembly by frictional engagement therewith; and a control is responsive to the movement of the members toward one another for energizing the drive motor to start the translation of the frame and is responsive to movement of the members apart to de-energize the motor.

A further object of the invention is to provide a spline pressing device of the character mentioned in which a pair of rollers, mounted on a supporting structure for movement toward one another, clamp a grooved frame and a spline therebetween so that translation of the clamped

2

frame and spline relative to rollers operates to progressively force the spline into the groove, one of the rollers acting as a tool to bear against the spline during such operation. More specifically it is sought to provide such a device in which one of the rollers, preferably the tool roller, is motor driven. As a preferential arrangement the invention also seeks to provide such a device in which the motor driven tool roller is stationary while the other roller is movable to apply the clamping pressure that forces the spline into the groove. A still further refinement of the preferential arrangement is one in which a control means, associated with the mechanism for moving the pressure roller, is so arranged that, upon movement of such roller toward the tool roller, the drive motor is energized to rotate the tool roller and, upon movement of the pressure roller away from the tool roller (releasing the clamped frame) the drive motor is de-energized.

Other objects and advantages relate to particular arrangements and combinations of parts looking toward simplification and economy and will become apparent as the following detailed description of a suitable embodiment proceeds. This description is made in connection with the accompanying drawings forming a part of this specification, like parts being indicated by the same numerals of reference throughout the several views.

In the drawings:

Figure 1 is a plan view of the spline pressing or placing device showing a screen frame mounted thereon;

Figure 2 is an elevational view of the device from the operator's side;

Fig. 3 is an end elevational view;

Fig. 4 is a sectional detail on an enlarged scale with respect to the preceding views and with parts broken away, showing the cooperating rollers that clamp the frame and spline assembly to press the spline into the groove of the frame;

Fig. 5 is a sectional detail taken substantially on the line 5—5 of Fig. 4;

Fig. 6 is a detail view, partly in section, showing the gear train and belt drive for actuating the driven tool roller, and

Fig. 7 is a detail view, partly in section, showing the driven tool roller and associated gear train for driving the same.

Work table

The spline placing device is preferably used in connection with a supporting structure or table A which comprises a pair of long legs 1 and a pair

of short legs 2 that support a substantially flat top 3 at an inclination to the horizontal, the table sloping downwardly toward the right as viewed in Fig. 3 toward the operator's station. This inclination of the table top supports work such as screen frame B in convenient position to be manipulated by the operator and so that the natural gravitational forces on the screen frame have a tendency to cause the latter to slide down the surface of the table top against aligned guides or stops 4 which may be in the form of straight metal or wooden strips secured to the top surface of the table adjacent and in parallel relation to the lower edge of the latter. The table legs 1 and 2 may be of wood or metal, such as metal angles, and are connected by a number of horizontal stabilizing cross members 5 adjacent their lower ends. The table top 3 is of flat smooth material such as sheet metal or composition wallboard to permit screen frames being assembled to be slid over the surface thereof with a minimum of frictional restraint. Reinforcing members 6 extend across between the upper ends of the legs 1 and 2 and underlie the table top 3 to support the latter.

Clamp rollers

Adjacent the surface of the table near the lower edge thereof a pair of rollers 10 and 11 are mounted for rotation about parallel axes that are also parallel to the article supporting surface of the table 3. The roller 10 is a tool or spline pressing roller and is secured vertically above the roller 10 on a shaft 12 having a fixed axis above the table surface. The roller 11 is movable toward and away from the tool roller 10 through an opening 13 in the table top 3. A lever arm 14 is centrally pivoted on a pin 15 carried by brackets 16 that depend from the underside of the table top 3 and are secured to the latter adjacent the opening 13 by screws 17. One end of the lever 14 is curved upwardly and is bifurcated to receive the pressure roller 11 which rotates on a shaft 18 supported in the bifurcated end of the lever. The other end of the lever is connected by a link rod 19 to a foot operated treadle 20 pivoted on one of the cross members 5 near the center of the latter and in a location convenient to the operator.

The weight of the pressure roller 11 and the bifurcated or left-hand end (Fig. 5) of the lever arm 14 normally causes the arm to turn on the pivot 15 in a counter-clockwise direction so that the pressure roller 11 is lowered through the opening 13 to a position below the article supporting level or the table top 3. A spring, not shown, may also be employed to raise the link rod 19 and the treadle 20 so as normally to hold the pressure roller 11 in lowered position in which it is withdrawn through the table opening 13 to an inactive position to avoid interfering with the movement of articles such as the screen frame B on the smooth table top.

When the treadle 20 is depressed by the operator the link 19 turns the lever 14 in a clockwise direction (Fig. 5) moving the pressure roller 11 upwardly through the table opening 13 and toward the tool roller 10 so as to clamp a screen frame and spline assembly therebetween.

Drive

The shaft 12, mounting the tool roller 10, is journaled in front wall 22 and a cross member 23 of a housing structure which encloses a gear train that is arranged to turn the shaft 12 and thereby

drive the tool roller or wheel 10. The housing also includes an outer wall or cover member 24 which is curved across the top of the housing and extends down the sides thereof. This continuous curved wall converges inwardly along the sides and downwardly along the top toward the front or journal wall 22 of the housing so that adjacent the tool wheel 10 the housing is relatively low and narrow. The housing wall, partitions and cross members may be made of metal, the parts being welded together, or as shown, the cover 24 can be made removable and held to an internal framework by cap screws 43, the framework being secured to a base plate 25 that extends beyond the side walls 24 and is apertured to receive bolts 26 that secure the housing structure to the table top 3.

A pair of countershafts 27 and 28 are mounted within the drive housing and are journaled in the cross member 23 and rear wall 29 of the housing for rotation about axes that parallel the rotational axis of the tool roller shaft 12. A series of reduction gears 30 and 31 on the shafts 12 and 27, respectively, and 32 and 33 on the shafts 27 and 28, respectively, form a gear train connecting the shafts in such a manner that rotation of the shaft 28 turns the tool roller 10 at a relatively low rate of speed but with considerable torque.

An electric drive motor 35 is mounted on horizontal supporting members 36 carried by cross frame members 37 and vertical frame members 38 attached to the table structure. A sheave or pulley 39, secured on a shaft driven by the motor shaft through an electrically controlled clutch (not shown), drives a V-belt 40 which extends upwardly through an opening in the table top and is trained around a larger pulley or sheave 41 secured on the end of the shaft 28 which projects through the wall 29 of the drive housing. In this manner the energy of the electric motor 35 is transmitted through the V-belt 40 and the gear train to drive or rotate the shaft for the tool roller 10 at a much lower rate of speed than the electric motor. A suitable speed for the roller 10 depends on the linear speed at which it is desired to insert or press the spline into the frame groove, and the circumference of the pressure roller. Employing a pressure roller approximately two inches in diameter and rotating such roller at from about fifty revolutions per minute to about two hundred revolutions per minute, preferably about one hundred thirty revolutions per minute is suitable for normal use and applications such as that described herein. A grease or lubricant is maintained within the drive housing and a curved cover or guard 42 is secured over the sheave 41, being attached to the drive housing by cap screws 43.

Control

Supports 44 are attached to and depend from the motor supporting members 36 and carry an upright panel 45 which is disposed adjacent the link rod 19. A control switch 46 for governing the energization of an electrically operated clutch built into the electric motor 35 is mounted on the panel 45 and is connected by electrical leads or conductors 47 to a suitable source of electrical current, not shown. Other electrical leads or conductors, not shown, connect the switch 46 to the motor clutch and still other conductors connect a source of electrical power to the motor to energize the latter. The switch is operated by a pivoted arm 48 having on its end a roller

49 that is engageable by the inclined surface of a cam 50 carried by link rod 19. The cam is slidable along guides 51 on the panel 45. When the treadle 20 is depressed by the operator to raise the pressure roller 11 upwardly through the table opening 13 into operative position, the downward movement of the link rod 19 moves the cam 50 against the switch roller 49 so that the switch 46 is actuated to open the electrical circuit (which otherwise energizes the motor clutch to disconnect the motor drive) thereby starting the rotation of the tool roller 10. Conversely when the operator releases the treadle 20 to drop the pressure roll 11 below the table level, the cam 50 releases the control switch 56 so that the built-in clutch of the drive motor 35 is energized, disconnecting the drive, and the tool roller 10 stops simultaneously with the lowering of the pressure roller 11.

Operation

In operating the device to assemble a spline in the groove of a frame, for example a rolled metal screen frame, the frame B is placed on the table 3 with the spline groove on the top or opening upwardly. Screening material C previously cut to proper size is then placed over the screen frame in overlapping relation with respect to the spline groove of the latter.

A spline D which may be in the form of a circular sectioned rod of deformable plastic material is then placed on the screening material along and in parallel relation to the frame groove. One end of the spline D is brought under the pressure or tool wheel or roller 10, the frame B being disposed against the guides 4 so as to extend across the table opening 3 in overlying relation to the pressure roller 11. The operator then depresses the foot treadle 20 drawing the link rod 19 downwardly to raise the pressure roller 11 upwardly against the underside of the frame B so that the latter is lifted substantially to the position indicated in Figs. 4 and 5. As the frame is thus raised the spline rod D is engaged by the tool roller 10 and forced downwardly into the groove of the frame B, the screening material C which lies between the spline rod D and the frame being forced into the groove ahead of the spline. The spline is of such diameter with respect to the groove in the frame that it has a press fit therein, holding the screening material tightly against the walls of the channel or groove.

The tool wheel 10 is narrower than the spline receiving channel in the screen frame and preferably is narrower than the spline rod D so that contact between the screening material C and the tool roller is avoided. This feature is of importance when the screening material C is of plastic material which might be damaged by contact with the roller 10.

As the bottom or pressure roller 11 raises the screen frame into operative position with respect to the tool roller 10 the cam 50 actuates the motor clutch control switch 46 which connects the drive for the tool roller 10 through the mechanism described. The electric motor 35 operates continuously, being governed by a master control switch. Frictional engagement between the tool roller 10 and the spline D causes the latter to be drawn along under the roller, feeding the spline into the channel or groove in the frame. The frictional grip of the channel side walls on the inserted portion of the spline D causes the screen frame B and the screening material C to be drawn along with the spline D so that the spline is progressively forced into the frame groove in a substantially continuous operation along the length of the frame member, the pressure roller 11 holding the frame in raised operative position and offering a minimum frictional resistance to the movement of the screen frame during the process.

When the spline has been thus inserted in the frame groove along one of the screen frame members to the end of the latter the operator releases the foot treadle which lowers the screen frame onto the table 3 and stops the rotation of the tool roller 10. The operator then turns the screen frame 90° on the table to bring the next adjacent member of the screen frame against one of the guides 4 and, after bending the spline around the corner of the frame, again depresses the foot treadle to raise the screen frame off the table into operative position with respect to the tool roller. The spline is then fed into the groove of the adjacent frame member in a continuous or progressive operation, pushing the screen material into the groove and feeding the screen frame along under the tool roller by frictional engagement with the spline.

At each corner the operator momentarily stops the tool roller and lowers the frame onto the table by releasing the foot treadle in the manner described so that the screen frame can be turned and the spline rolling process performed in sequence along each of the sides of the screen frame. During each spline placing movement the screen frame is guided by the strips 4 to prevent the tool roller 10 from riding out of the spline groove. After the spline D has been inserted in the spline groove along all four sides of the screen frame the excess screening material and spline rod or strip are trimmed off and the operation is complete.

Although the process has been described using a single flexible spline of deformable material that extends along all four sides of the screen frame, it is also contemplated to use four separate pieces of spline material, each being inserted in the groove of one of the screen frame members.

The principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, substitution of parts and changes in construction being resorted to as desired, it being understood that the embodiment shown in the drawings and described above and the particular method set forth are given merely for purposes of explanation and illustration without intending to limit the scope of the claims to the specific details disclosed.

What we claim is:

1. A device for placing splines in grooved frames comprising a frame receiving table, a spline pressing tool mounted above the table, a member mounted on the table and movable to raise a frame above the table into association with the tool so that the tool engages a spline disposed along the groove of the frame and presses such spline into the groove, and means for actuating the tool while the latter is engaging the spline to effect relative movement of the tool and supporting member along the raised frame and spline.

2. A device for placing splines in grooved frames comprising a frame receiving table, a spline pressing tool mounted above the table, a member mounted on the table and movable to raise a frame above the table into association

with the tool so that the tool engages a spline disposed along the groove of the frame and presses such spline into the groove, means for actuating the tool while the latter is engaging the spline to effect relative movement of the frame with respect to the tool, and control means governing the tool actuating means and including means responsive to said raising movement of the frame raising member for energizing the actuating means and responsive to reverse movement of such member for de-energizing the actuating means.

3. A device for placing splines in grooved frames comprising frame supporting means, a spline pressing tool, means for relatively moving the tool and the supporting means toward one another so that the tool frictionally engages a spline associated with the groove in a supported frame and forces the spline into the groove, means for actuating the tool while the latter is engaging the spline to cause the frame to move relative to the tool, and control means governing the tool actuating means and including means responsive to said relative movement of the tool and the supporting means for energizing the actuating means upon relative movement of the tool toward the supporting means and for de-energizing the actuating means upon relative movement apart thereof.

4. A device for placing splines in grooved frames comprising a frame receiving supporting structure, a rotary spline pressing tool mounted on said structure, a member mounted on the structure for movement toward and away from the rotary tool, means for operating said member to bear against a frame received on the structure and move the frame so that a spline associated with the frame groove is brought into engagement with the rotary tool and pressed thereby into the groove and the member holds the frame with the rotary tool against the spline so that translation of the frame and the spline along the tool places the spline in the groove in a substantially continuous operation, and means for rotating the tool while the tool engages the spline whereby said translation of the frame and the spline is effected through frictional contact between the tool and the spline.

5. A device for placing splines in grooved frames comprising a frame receiving supporting structure, a rotary spline pressing tool mounted on said structure, a member mounted on the structure for movement toward and away from the rotary tool, means for operating said membe to bear against a frame received on the structure and move the frame so that a spline associated with the frame groove is brought into engagement with the rotary tool and pressed thereby into the groove and the member holds the frame with the rotary tool against the spline so that translation of the frame and the spline along the tool places the spline in the groove in a substantially continuous operation, means for rotating the tool while the tool engages the spline whereby said translation of the frame and the spline is effected through frictional contact between the tool and the spline, and control means governing the tool rotating means and including means responsive to said movement of the member toward the tool to energize the rotating means and responsive to said movement of the member away from the tool to de-energize the rotating means.

6. In a spline inserting device, or the like, a table structure for supporting a grooved frame

for movement to different positions thereon, a wheel and means mounting the same for rotation above the table, a member movable relative to the table for engaging a frame supported on the table and moving the frame toward the wheel whereby the wheel can force a spline disposed along the groove into the latter, the member being arranged to hold the frame against the wheel while the latter is rolled along a spline being inserted in the groove, and means for driving the wheel to draw the frame along by frictional engagement with the spline.

7. In combination in apparatus for assembling splines into grooved members of sash frames and the like, a table for supporting a grooved frame for movement to different positions thereon, a tool wheel and means supporting such wheel for rotation above the table, the table having an opening below the tool wheel, a member supported by the table for up and down movement through the table opening, and means for actuating the movable member to move upwardly through the opening against the underside of a grooved frame member supported on the table and to raise such member off the table and toward the tool wheel whereby a spline disposed in registry with the groove of the frame member is engaged by the tool wheel and pressed into the groove, and means responsive to the upward movement of the movable member for rotating the tool wheel to move said frame by the frictional thrust of said wheel on said spline and to progressively press said spline into the groove.

8. In combination in apparatus for assembling splines into grooved side members of sash frames and the like, a table for supporting a sash frame for movement to different positions thereon and having a longitudinal guide for engagement with a side edge of a sash frame, a tool wheel and means supporting such wheel for rotation above a grooved frame member engaging said guide, the table having an opening below the tool wheel, a roller and means supporting the roller on the table for up and down movement through the table opening and for rotation about an axis generally parallel to the rotational axis of the tool wheel, means for raising the roller above the table level against the underside of the grooved frame member in engagement with said guide to tilt the sash frame on the table and to lift such member off the table and to hold such member against the underside of the tool wheel whereby a spline disposed in registry with the groove of the frame member is engaged by the tool and pressed into the groove, and means responsive to up and down movement of the roller for driving the tool wheel while the roller is above table level to move said frame along said guide and to progressively press said spline into the groove.

9. In combination in apparatus for assembling splines into grooved side members of sash frames and the like, a table for supporting a grooved frame for movement to different positions thereon, means on the table engageable with a supported frame to guide the frame along a substantially rectilinear path, a tool wheel and means supporting such wheel for rotation above the table in a plane substantially parallel to said path, means for actuating the movable member to move upwardly against the underside of a grooved frame member to tilt the sash frame and raise such member off the table and against the tool whereby a spline disposed in registry with the groove of the frame member is engaged by

the tool and pressed into the groove, the guide means being adapted to remain in guiding relation to a frame member during the raising thereof and to locate the frame member in predetermined relation to the tool wheel, and means for driving the tool wheel so that an engaged spline is progressively pressed into the groove of the raised frame and the latter is moved longitudinally along the guide by frictional driving engagement between the rotating tool wheel and the spline.

10. Apparatus for placing splines in grooved side members of sash frames or the like, a sash supporting table inclined downwardly toward a side edge thereof, a longitudinal guide on the able adjacent its lower side edge for positioning a sash with a grooved side member thereof against said guide, a spline pressing wheel positioned to overlie the grooved side member that engages said guide at a distance above the same less than the height of said guide, a vertically movable roller positioned to underlie said wheel for lifting the side of the frame engaging said guide and engaging a spline overlying the groove of the frame side member with said wheel to press the same into the groove, actuating means for raising and lowering said roller, and means for driving said wheel to advance said frame along said guide and to progressively press said spline into the groove.

11. Apparatus for placing splines in grooved side members of sash frames or the like, a sash supporting table inclined downwardly toward a side edge thereof, a longitudinal guide on the table adjacent its lower side edge for positioning a sash with a grooved side member thereof against said guide, a spline pressing wheel positioned to overlie the grooved side member that engages said guide at a distance above the same less than the height of said guide, a vertically movable roller positioned to underlie said wheel for lifting the side of the frame engaging said guide and engaging a spline overlying the groove of the frame side member with said wheel to press the same into the groove, actuating means for raising and lowering said roller, means for driving said wheel to advance said frame along said guide and to progressively press said spline into the groove, and means operated by said roller actuating means for controlling said wheel driving means to start rotation of said wheel in response to upward movement of said roller and to stop said wheel when said roller is lowered.

FRANK C. RUSSELL.
CHARLES W. PORTER.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
391,441	Warner	Oct. 23, 1888
554,907	Bosley	Feb. 18, 1896
739,342	Peregrine	Sept. 22, 1903
1,026,789	Darlinton	May 21, 1912
1,496,239	Lynch	June 3, 1924
1,665,522	Barr	Apr. 10, 1928
1,713,809	Allee	May 21, 1929
1,931,786	Zimmerman	Oct. 24, 1933
1,958,965	Goldberg	May 15, 1934
2,219,805	Buttress	Oct. 29, 1940