

Aug. 27, 1957

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2,804,101

APPARATUS FOR APPLYING SCREENING MATERIAL TO FRAMES

Original Filed Aug. 15, 1949

4 Sheets-Sheet 1

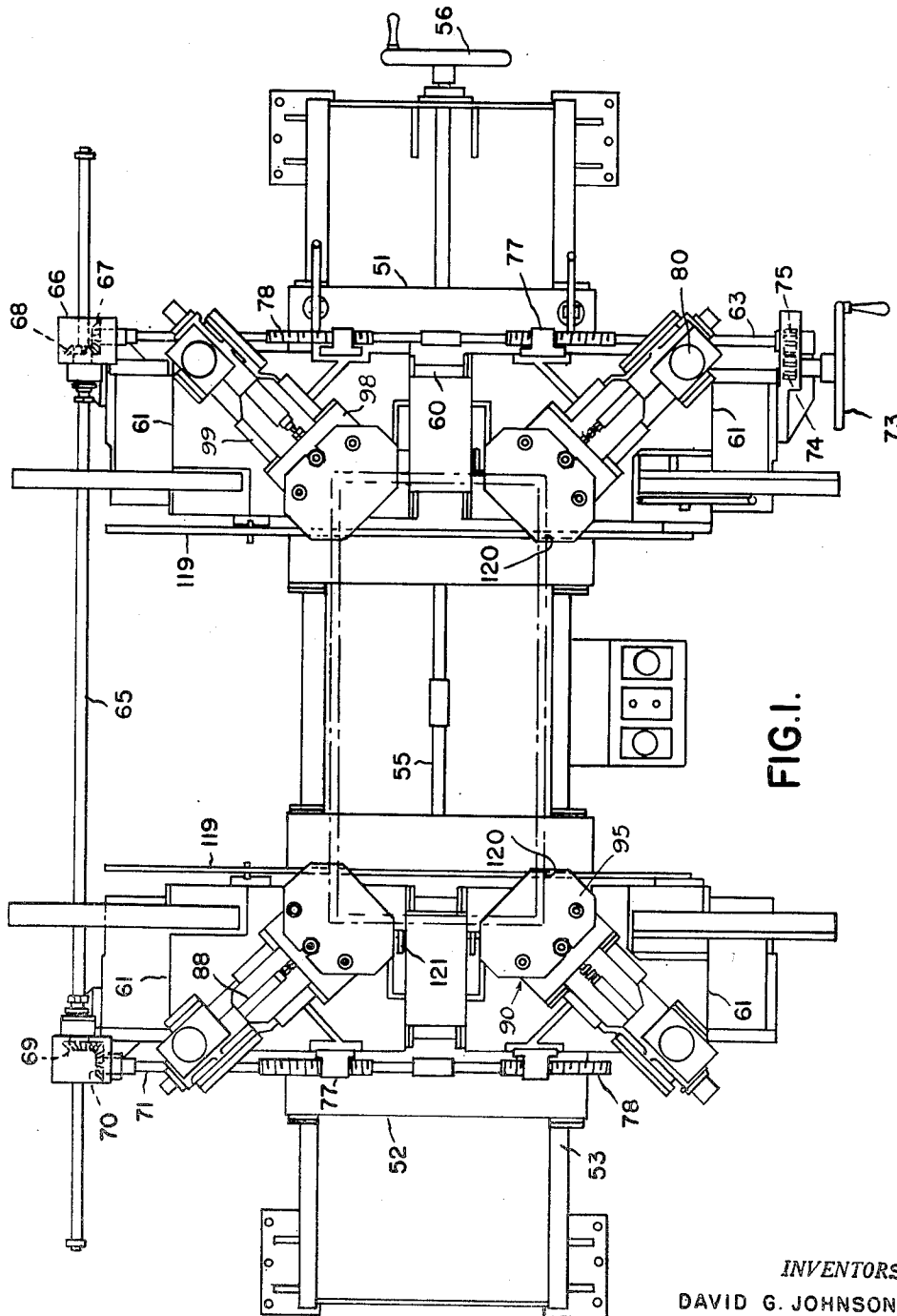


FIG. 1.

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Original Filed Aug. 15, 1949

4 Sheets-Sheet 2

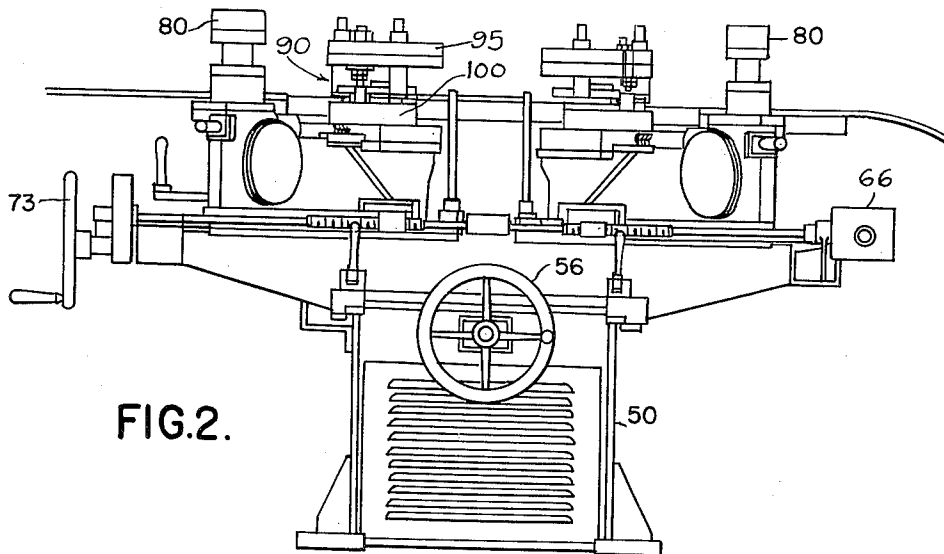


FIG.2.

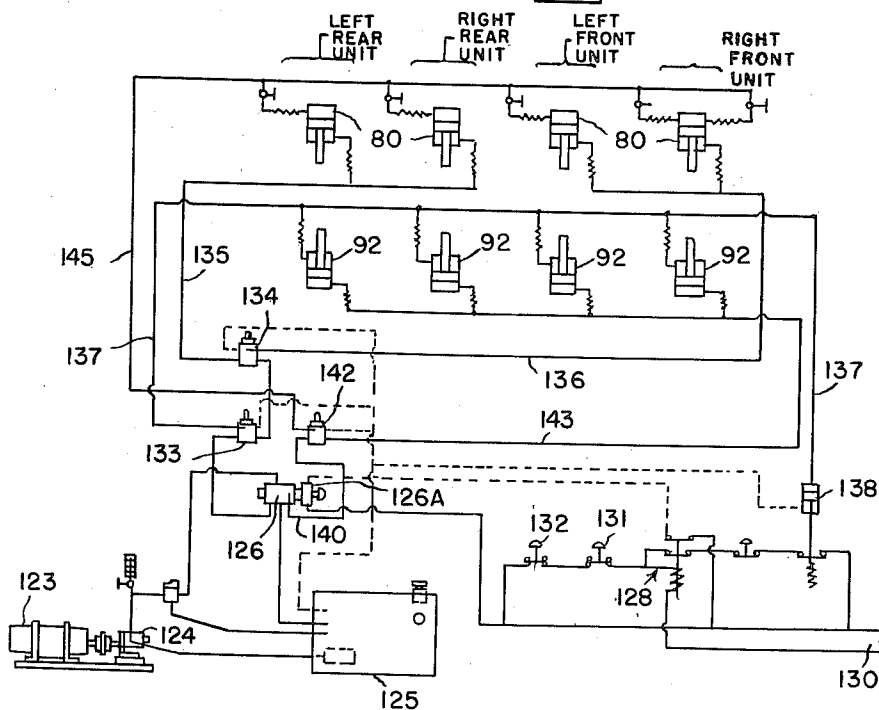


FIG.8.

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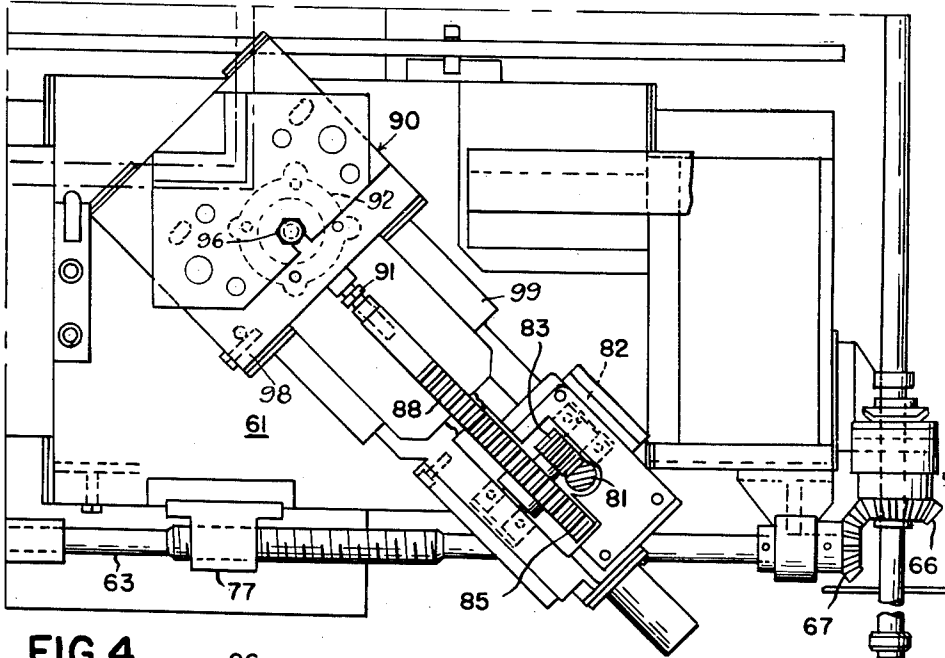


FIG. 4.

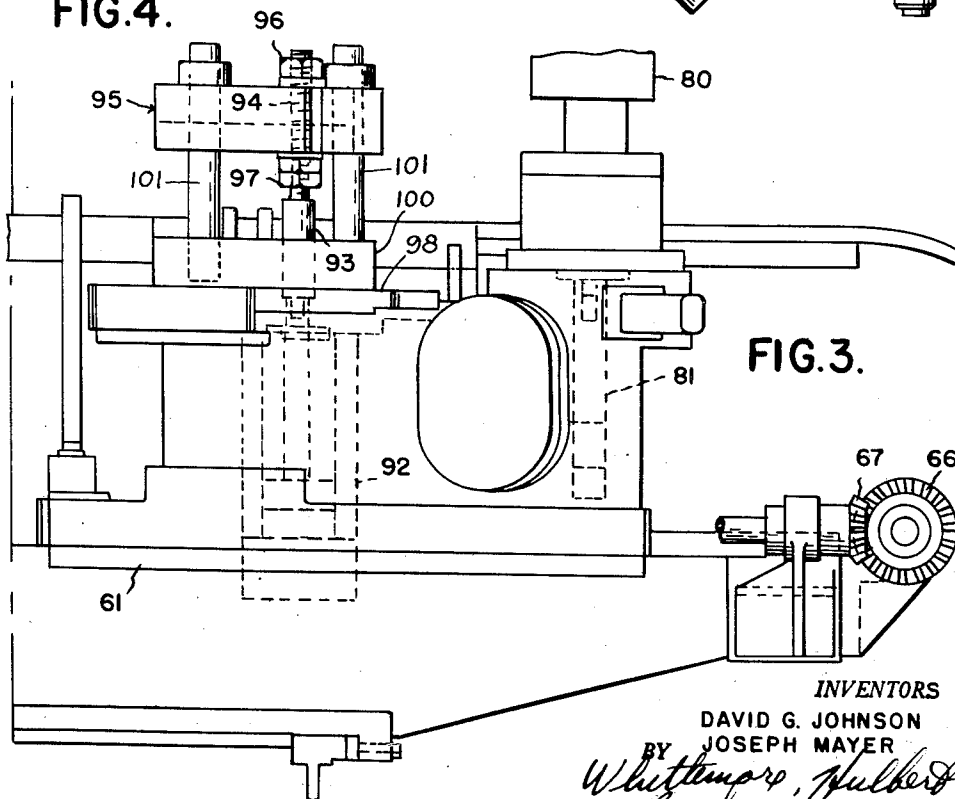


FIG. 3.

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FIG. 6.

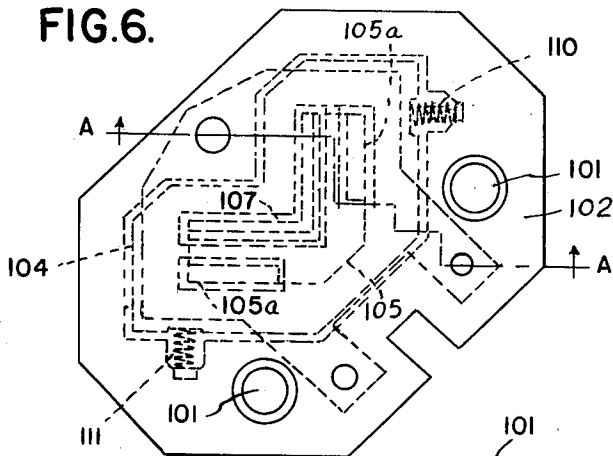


FIG. 7.

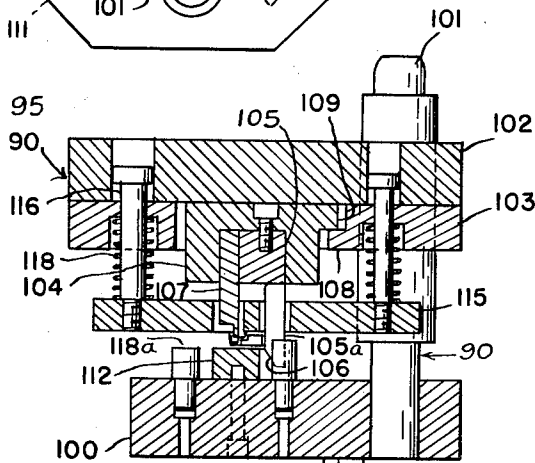


FIG. 7A.

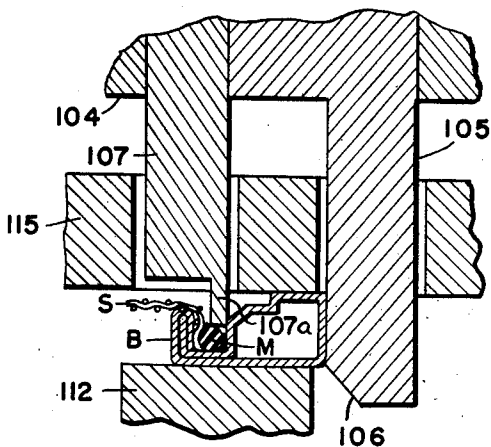
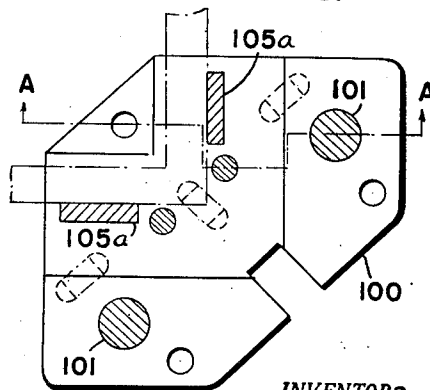


FIG. 5.



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APPARATUS FOR APPLYING SCREENING MATERIAL TO FRAMES

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Original application August 15, 1949, Serial No. 110,392, now Patent No. 2,695,444, dated November 30, 1954. Divided and this application April 12, 1954, Serial No. 422,548

14 Claims. (Cl. 140—169)

The present invention relates to apparatus for applying screening material to a screen frame. The screening material can be wire cloth, textile fabric, plastic, or other material suitable for covering the opening of a frame.

The present application is a division of our prior copending application Serial No. 110,392, filed August 15, 1949, now Patent 2,695,444.

In a specific adaption, the present invention relates to apparatus for pressing screen material into the corners of a continuous rectangular channel provided in a screen frame, and is particularly useful in conjunction with other apparatus for applying the material to the frame, pressing the material into the straight portions of the channel, and severing the material between adjacent ones of a series of frames, as fully disclosed in our prior copending application Serial No. 110,392. More generally however, the apparatus disclosed herein may press screen material into the entire rectangular channel of the frame, while at the same time severing excess screen material along the outer edge of the channel.

It is an object of the present invention to provide apparatus for facilitating the application of screening material to screen frames, and particularly to metallic screen frames.

It is a further object of the present invention to provide apparatus for simultaneously applying screening material to screen frames and trimming excess screening material.

It is a feature of the present invention to provide apparatus for applying the screening material to the corners of the frame channels in which the die heads are sequentially movable to first locate the screen frame against stationary abutments, and thereafter to engage the opposite end of the screen.

It is a further feature of the present invention to provide apparatus of the character last described in which the die heads are arranged in pairs, the individual die heads all being movable diagonally inwardly with respect to the machine, and means for effecting sequential operation of the die heads in pairs so as to first move the screen accurately into position against stops by movement of one pair of die heads, and thereafter to move the remaining pair of die heads into operating position.

It is a further feature of the present invention to provide apparatus for applying screening material and/or splining material to the corners of the frame channels, comprising punch elements including beveled guide portions adapted to engage the outside edges of the screen bars, the punches being universally adjustable to be guided thereby into accurate registry with the frame channels.

It is a further object of the present invention to provide apparatus for applying screening material to channel frames which comprises blade elements including angularly disposed portions adapted to enter intersecting corners of the grooves or channels in the frame, and

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rectilinear portions adapted to enter straight groove or channel portions spaced from the corners of the frame. It is thus possible to apply a complete section of screening material to an entire frame in a single pressing operation.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a plan view of apparatus for pressing screen material into the corners of a frame, and for trimming excess screen material therefrom.

Figure 2 is a side elevation of the apparatus shown in Figure 1.

Figure 3 is an enlarged side elevation of the die mechanism at one corner of the apparatus shown in Figures 1 and 2.

Figure 4 is a plan view of the structure shown in Figure 3.

Figure 5 is a plan view of the bottom shoe of the die mechanism.

Figure 6 is a plan view of the top shoe of the die mechanism.

Figure 7 is a composite sectional view of the assembled die mechanism in which the bottom shoe is illustrated on the section line A—A, Figure 5, and the top shoe and associated mechanism is illustrated on the section line A—A, Figure 6.

Figure 7A is a fragmentary enlarged sectional view through the die assembly and screen frame.

Figure 8 is a wiring and control diagram for the apparatus.

Before referring specifically to the drawings which illustrate a preferred embodiment of the present invention, a general description of the entire process will be given.

The invention relates generally to the application of screening material such as wire cloth to screen frames and preferably to screen frames in which the bars of the frame are formed of metal. The application of screening material to the frames is carried out in three phases and for this purpose three separate machines are employed.

In the first operation, a machine is provided supporting a continuous roll of screening material such as wire cloth thereon and additionally supporting a pair of reels carrying a continuous supply of a suitable splining material. The splining material may be any suitable material, but excellent results have been obtained when a plastic material is employed. A series of screen frames are advanced through the machine into contact with the screening material and the splining material, and screening and splining rolls are brought into operation to force the screening material and splining material into the grooves or channels of the frame. This operation also trims excess width of screening material from the frame.

In order to provide precisely the desired tension in the finished product, a certain amount of slack is provided in the screening material transversely of the frame prior to the rolling operation. During the rolling operation the screening material is forced downwardly into the channels, thus setting up a transverse tension in the screening material. In order that the transverse tension thus set up in the screening material shall not produce inwardly bowed side bars of the frame, it is within the contemplation of the present invention that the frame bars shall be outwardly bowed initially and the tension of the screen will be just sufficient to cause the frame bars to become straight. However, if the bars of the screen frame are of the preferred rigidity, this initial outward bowing of the bars will not be necessary.

The screen frames are advanced through the machine as a result of positive turning of the screening and splining rolls. Screen frames ahead of the particular frame

in contact with the rolls are pushed ahead by engagement with succeeding frames. Alternatively, separate means may be provided for pushing the screen frames through the machine, in which case the screening and splining rolls will be rotated by their engagement with the channels in the screen frame. While the former arrangement in which the rolls are positively driven is preferred, it is to be understood that the latter arrangement, in which the frames are directly propelled through the machines by means independent of the rolls is also within the scope of the present invention.

The machine for carrying out the first operation includes a cut-off mechanism adapted to sever the continuous screening and splining material between adjacent frames. If preferred, the machine can be used with screening material cut to length before entering the machine, in which case the cut-off knife will not function.

As the frames emerge from the first operation each frame has a section of screening material applied thereto and rolled and preferably splined into channels along two opposite sides thereof, the application of the screening material and splining material to the channels of the frame however, not extending completely to the ends of the channels.

The second operation is carried on a separate machine into which the individual screen frames are introduced so as to roll the edges of the screening material and splining material into the two remaining sides. This operation is generally similar to the first operation except that it is of course unnecessary to sever screening material between adjacent frames. However, it is necessary to sever the continuous splining material between adjacent frames and suitable mechanism for accomplishing this purpose automatically is provided.

The machines for carrying out the first and second operations are largely automatic in operation, requiring only that the operator introduce screen frames into the machines and close a starting switch, after which the operation is continuous and fully automatic to complete the rolling of the frame last introduced and to sever the screening and/or splining material between adjacent screen frames.

As the frames emerge from the second operation each frame has secured thereto an area of screening material which is rolled into grooves or channels along all four sides, but the screening material is not forced into the corners where the grooves or channels of the frame intersect.

The third operation is the application of the screening and splining material to the intersecting channel corners. This is carried out in a machine which has four punches, each of which is right angular in shape and is adapted to enter into a corner of the screen frame. The individual punches include camming surfaces and are mounted for universal movement so that they are guided into exact registry with the corners of the frame channels by engagement between the inclined surfaces of the punches and the outside surfaces of the screen frames. The punches are arranged to force the screening material fully into the corners of the frames, and also to sever excess screening and splining material. This mechanism is also semi-automatic, requiring only that the operator introduce the frame into the machine in approximate operating position and close a pair of starting switches. Thereafter, clamping means operate sequentially to move the frame to operating position and to clamp the frame in such position. After the frame is firmly clamped in desired position, the punches move downwardly to complete the screen and thence move upwardly and the die heads retract diagonally outward to provide access for replacing the completed screen with another. The machine is arranged such that as the new frame is inserted into the machine it pushes the old screen out with a simple sliding movement.

The machine comprises a base 50 having a pair of sub-slides 51 and 52 movable toward and away from each

other along ways indicated at 53 in Figure 1. Means are provided for moving the sub-slides 51 and 52 simultaneously either toward or away from each other and this means comprises a shaft 55 having a hand wheel 56 carried by the base 50, the shaft 55 having right and left hand threaded portions underlying the sub-slides 51 and 52.

The sub-slides 51 and 52 are each provided with a depending internally threaded feed nut for cooperation with the corresponding threaded portions of the shaft 55 which cooperates therewith. The shaft 55 is of course anchored in the base against longitudinal displacement and rotation of the hand wheel 56 results in simultaneous movement of the sub-slides 51 and 52 toward or away from each other.

Mounted on ways 60 on the sub-slides 51 and 52, are pairs of slides 61 and means are provided for moving the individual slides 61 of each pair toward or away from each other. This means comprises a first shaft 63 mounted on the sub-slide 51 and retained thereon against axial displacement. Intermediate the sub-slides 51 and 52 is a cross shaft 65. At the end of the shaft 63 is a gear box 66 containing a first bevel gear 67 keyed or otherwise secured to the shaft 63, and a second bevel gear 68 meshing with the bevel gear 67 and keyed to the shaft 65 in a manner to permit sliding movement thereon. At the opposite end of the shaft 65 is another bevel gear 69 slidable on the shaft 65 and meshing with a bevel gear 70 keyed or otherwise secured to a shaft 71 rotatably mounted but retained against axial displacement on the sub-slide 52. A hand wheel 73 effects rotation of the shaft 63 through a pair of gears 74 and 75 and rotation of the shaft 63 is transmitted to the shaft 71 through the bevel gears previously referred to, in any position of adjustment of the sub-slides 51 or 52. Each of the slides 61 has extending therefrom an adjusting nut 77, one nut of each pair being right hand and the opposite nut of each pair being left hand. The shafts 63 and 71 are provided with corresponding right and left hand threaded portions 78, the arrangement being such that rotation of the hand wheel 73 causes simultaneous approach or separation between the slides 61 of each pair.

Mounted on each slide 61 is an assembly shown in detail in Figures 2-7. On the slide 61 is located on hydraulic cylinder 80 having a piston rod 81 extending downwardly therefrom, which is provided with rack teeth. Located in a housing provided on the slide 61 is a stub shaft 82 having a pinion 83 carried thereby which is adapted to mesh with rack teeth formed on the piston rod 81. The shaft 82 also carries a larger gear 85 which meshes with the teeth of a horizontal rack 88 mounted for reciprocation on the slide 61 in a direction diagonal to the position of a frame carried on the machine. At the inner end of the rack 88 there is secured the die assembly indicated generally at 90, comprising a die head assembly 95, and a bottom shoe 100 carried by plate 98 movable on ways indicated at 99. For precise adjustment of the die assembly relative to the rack, an adjusting bolt 91 is provided having threads of opposite hands at opposite sides thereof received in correspondingly threaded recesses provided at the end of the rack and in the die assembly 90.

Depending from the adjustable die assembly is a hydraulic cylinder 92 having a piston rod 93 secured to vertical shaft 94, which carries the movable die head assembly 95, these being secured thereto by adjusting nuts 96 and 97.

Cylinders 80 and 92 are designed to have stops for the pistons operating therein, and the pressure in the cylinders builds up after the pistons reach the end of the stroke. The connections between the pistons and dies are adjustable, and the increased pressure required to operate the sequence valve is therefore not applied to the parts moved by the pistons, since the pressure builds

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up only after the pistons have reached the end of their strokes.

Referring now to Figures 5, 6, and 7, the die assembly 90 comprises a bottom shoe 100 having a pair of up-standing guide posts 101 carried thereby. Slidably mounted on the guide posts 101 is the die head assembly 95 comprising a top shoe 102, a guide plate 103, and a die block 104. The die block has secured thereto a guide member 105 having two depending portions 105a, each having a beveled edge 106 and a punch 107. The punch 107 has a narrow L-shaped portion shaped to enter into the groove or channel of the screen frame at a corner thereof to force the screening material and the splining material into the corners and to trim away the excess material. The die block 104 is slidably mounted for universal movement in a plane parallel to the adjacent surface of the top shoe and is held in position thereon by a ledge 108 formed on the guide plate 103, the die block having an outwardly extending flange 109 overlying the ledge 108 and cooperating therewith to retain the die block against the top shoe.

As is apparent from an inspection of Figure 6, the punch 107 includes angularly related portions designed to enter into the corner of the channel in the screen frame. The guide member 105, as best indicated in Figure 5, includes the two depending portions having the beveled camming edges 106 engageable with the outside surfaces of the screen frame adjacent the corners thereof.

Compression springs indicated at 110 and 111 are provided urging the die block inwardly toward the center of the screen, but permit yielding as the beveled edges of the guide portions 105a engage the outside corners of the screen frame. The adjacent surfaces of the guide portions 105a and punch 107 are so spaced as to cause the punch to press against the outer surface of the screen frame channel, and hence to trim away the excess screen material.

Referring now to Figure 7A the manner in which the blade 107a of the punch 107 cooperates with the channel of a screen frame bar indicated at B is illustrated. In this figure it will be observed that the screen frame bar B has an outer surface thereof engaged by the inner surface of the guide member portion 105a and that the blade 107a of the punch has entered the channel of the screen frame bar B. The spacing between the adjacent surfaces of the blade 107a of the punch and the guide 105 is such that the blade 107a is caused to bear forcibly against and exert a shearing action across the outer surface of the channel in the frame bar B. The screen frame is indicated at S and extends from the inner wall of the channel across the screen frame to the channel in the screen frame bar at the opposite side of the screen frame. As is fully described in our prior copending application Serial No. 110,392, now Patent 2,695,444, spline material may be employed in the channel of the screen frame bar to retain the edge of the screen frame in position. This spline material is illustrated at M in Figure 7A.

The bottom shoe 100 has a fixed die block 112 thereon which is of right angular shape and is adapted to underlie the groove or channel of the screen frame, and to back the screen frame up as blade 107a of the punch 107 enters the groove or channel.

A stripper plate 115 is carried by the top shoe and is secured thereto by stop bolts 116, the heads of which serve as stop elements against the upper surface of the guide plate 103. Compression springs 118 are provided intermediate the stripper plate and the guide plate and urge the stripper plate downwardly. With the parts in the relationship illustrated in Figure 7, it will be appreciated that upon upward movement of the punch, springs 118 will retain the stripper plate in its lowermost position, thus holding the screen frame on the fixed die blocks until the heads of the stop bolts 116 are engaged, thereafter elevating the movable die assembly and stripper plate as a unit.

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If desired, fixed rigid stripper fingers (not shown) may be provided on locating pins 118a, and stripper plates 115 omitted.

Referring again to Figure 1, each of the slides 51 and 52 has secured thereto frame supporting bars 119. Adjacent the front of the machine where the starting switches are located, the bars 119 each have a shoulder whose location is indicated at 120 which is at the top of the bar and faces away from the operator whose position is at the right in Figure 1. After the machine has been properly adjusted for a particular size of frame, including adjustment of approximate side guide members 121, the operator pushes a screen frame into the machine onto the bars 119 and forwardly of the shoulders 120 thereon. Thereafter, he moves the screen frame back against the shoulders 120, which together with the side guide elements 121, approximately positions the screen for the next operation.

The die heads are controlled so that the right and left rear die heads move inwardly first into engagement with the corners of the screen frame, and locate the screen frame against the shoulders 120 previously referred to. Thereafter, the right and left front die heads move into operative position.

The punches are then depressed to force the screening and splining material into the corners of the grooves or channels of the frame and to trim excess screening material, and are thereafter elevated and moved rearwardly with their respective die heads. The operator then introduces the next frame into the machine, at the same time pushing the completed frame forwardly out of the machine. The completed screen may be ejected with a simple sliding motion and the next frame is moved forwardly of the shoulders and the die block back on the guide bars 119 into engagement with the shoulders 120.

The positioning of the die heads in registry with the corners of the screen frame, and the actuation of the punches to force the screening material and splining material into the corners and to trim such material, is accomplished by hydraulic cylinders.

Referring now to Figure 8, the hydraulic system and the electrical control mechanism therefor is illustrated.

The hydraulic system comprises a motor 123 connected to a hydraulic pump 124 which in turn is connected to an oil tank 125, all of this mechanism conveniently being housed within the base of the machine. A four-way solenoid control valve 126 is provided having a control solenoid indicated at 126A which is connected through a solenoid control switch 128 to a source of current indicated at 130. A pair of starting switches 131 and 132 are provided in series so that the operator is required to use both hands to initiate operation of the machine. Closure of switches 131 and 132 establishes a circuit through the solenoid of the switch 128, thus completing a circuit to the solenoid 126A as well as establishing a holding circuit through the solenoid of the switch 128.

Energization of the solenoid 126A operates the valve 126 to direct fluid through sequence and check valves 133 and 134 through the line 135, to the pair of cylinders 80 located at the left and right hand rear of the machine. This has the effect of moving the rear die assemblies diagonally forward an amount determined by stops on the piston rods. At this time, the forward edge of the screen is engaged against the stop shoulders 120 on the supporting bars 119. As soon as movement of the die heads has been arrested by the piston coming to the end of its stroke, pressure in the line 135 will build up and when it reaches a predetermined amount, as for example 200 pounds per square inch, the sequence valve 134 will open a passage to the line 136, which will admit fluid to the cylinders 80 at the left and right front of the machine. This will move the front die heads diagonally inwardly into operating position. When the pistons in the front cylinders 80 are arrested, pressure in the supply line will continue to build up, and at some higher pressure, such for example as

300 pounds per square inch, will operate the sequence valve 133 to admit fluid to the line 137, which will supply fluid to all four of the hydraulic cylinders 92 simultaneously, thus moving the punches down uniformly against the screen and performing the final operation thereon. When the punches reach their lower limit of motion, pressure in the supply line will continue to build up and will actuate the pressure switch 138 through the supply line 137. When this pressure reaches some predetermined higher value, such for example as 400 pounds per square inch, the pressure switch 138 will open, thus interrupting the holding circuit through the solenoid of the switch 128, thereby opening the circuit to the solenoid 126A. The valve 126 is so arranged that when the solenoid 126A is de-energized, fluid is directed through the line 140 to sequence valve 142, whence at low pressure it is directed to the line 143 leading to the four cylinders 92 and connected thereto in a direction to cause the punches to be raised out of the frame channels.

When the punches are elevated to their limiting upper position, pressure in the line 143 increases and at some predetermined higher pressure, such for example as 300 pounds per square inch, the valve 142 operates to direct fluid to the line 145, which is connected to the opposite side of the cylinders 80 and will actuate these cylinders in a direction to cause the die heads to move diagonally outward in sufficient amount to clear the screen frames. This completes the cycle and it is necessary only for the operator to push the completed screen out of the machine with the next frame, to push the next frame against the stop 120, and to actuate both starting switches 131 and 132.

The shoulders 120 may function as approximate locators, and if desired inward movement of all four heads 90 may be simultaneous, since it is only necessary for the beveled edges 106 of the guide members 105 to engage the outer edges of the frames.

While the foregoing operation has been described as designed to press the screening material only into the corners of the grooves and portions of the grooves directly adjacent the corners, it will of course be understood in the proper case the blades may be extended sufficiently so as to press the screening material not only into the grooved corners but also into the complete length of the groove intermediate the corners.

Instead of pressing screen material into the four corners of a single frame, the apparatus may be designed to press screen material into two corners of one frame, and the adjacent two corners of a second frame in edge abutment therewith, this bringing the die assemblies into closer spaced relation and reducing the size of the apparatus.

The drawings and the foregoing specification constitute a description of the improved apparatus for applying screening material to frames in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What we claim as our invention is:

1. Apparatus for applying screening material to screen frames having channels therein for receiving the screening material comprising a frame support, a die head assembly on said support, said assembly comprising a punch shaped to enter the frame channel, means for effecting relative approach and separation between said die head assembly and frame support to cause said punch to enter the channels in said frames and to force screening material therein, said die head assembly including a guide portion having an inclined camming surface engageable with the outside edge of the screen frames, said guide portion being rigidly spaced laterally from said punch an amount sufficient to force said punch to bear against the outer surfaces of the channels in the screen frames to trim away excess screening material.

2. Apparatus in accordance with claim 1 in which said

punch and guide portion are mounted for limited movement in a direction parallel to the frames.

3. A die head assembly for applying screening material to a metal screen frame having channeled bars, said die head assembly having a screening element shaped to enter the channel of a screen bar to force screening material therein, said die head assembly having in addition a second element spaced a fixed distance laterally from said screening element and having a portion tapering inwardly toward said screening element and engageable with the outer surface of the screen bar, said spacing between said screening element and said second element being such that said second element causes said screening element to bear against the outer surface of the channel in the frame bar to sever excess screening material as the screening material is forced into the channel.

4. Apparatus for applying screening material to frames provided with a channel to receive the screening material, comprising a base, a support for the screen frame, a die head assembly mounted on said base adapted to move toward said support, a punch carried by said die head assembly, said punch having a screening portion shaped to enter the channel, power means to move said die head assembly toward said support to cause said screening portion to enter the channel forcing the screening material therein, a second portion on said die head assembly spaced laterally from said screening portion and having a camming surface adapted to engage the outside edge of the frame to guide said screening portion into the channel.

5. Apparatus for pressing screening material into the grooves at the corner of a screen frame comprising a support, a die head movable toward and away from said support, said die head including a floating die located to cooperate with the corner of a screen frame located on said support, resilient means urging said die diagonally inward with respect to the frame, said die comprising an angular guide having inclined camming surfaces engageable with two outside surfaces of a screen frame at the corner thereof, and an angular blade located inwardly of the frame from said guides and disposed to enter the adjacent corner of the frame groove.

6. In an apparatus for applying screening material to frames provided with a channel to receive the screening material, a head, a punch mounted on said head shaped to enter the channel to force the screening material therein, and a guide portion mounted on said head spaced from said punch having a camming surface to engage the frame to guide said punch into the channel and to force the punch into shearing engagement with the outer surface of the channel.

7. In an apparatus for applying screening material to frames provided with a channel to receive screening material, a support for the frame, a head adapted to move toward said support, a punch shaped to enter the channel to force the screening material therein, a guide portion spaced from said punch and having a camming surface to engage the frame to guide said punch into the channel and to force the punch into shearing engagement with the outer surface of the channel, said punch and guide mounted on said head for limited movement in a plane normal to the movement of said head toward said support.

8. Apparatus for pressing screening material into the corners of intersecting channels provided on a rectangular screen frame, comprising a frame support, power means on said support for positioning and clamping a screen frame, a die head having angularly disposed camming portions shaped to engage the outer sides of a frame at both sides of a corner thereof, each of said camming portions having an inclined camming surface, a punch on said die head having angularly disposed intersecting blades shaped to enter the corner provided by said intersecting channels, and means for moving said die head toward and away from said support.

9. Apparatus for applying screening material to a frame comprising bars having grooves or channels extending longitudinally of said bars for receiving the screening material, said apparatus comprising a frame support, means for inserting screening material into the grooves or channels of said frame and for simultaneously severing excess screening material adjacent the outer side of the grooves or channels, said means comprising a device including a narrow blade element shaped to enter a groove or channel of the frame and to press screening material into the groove or channel, and a guide element having an inclined camming surface rigidly spaced laterally from said narrow blade element in position to engage the outer surface of the frame bar, means on said frame support mounting said device for limited movement in a direction transverse to said narrow blade element, actuating means for causing relative approach and separation between said device and said support to cause the inclined camming surface of said guide element to engage the outer surface of a frame bar to insure registration between said narrow blade element and the groove or channel of the frame bar upon relative approach between said device and support, the spacing between said narrow blade element and said guide element being such as to cause said narrow blade element to bear forcibly against the outer surface of the groove or channel so as to sever excess screening material adjacent the outer edge of the groove or channel.

10. Apparatus as defined in claim 9 in which a second blade element is provided intersecting said first mentioned blade element at right angles for pressing the screening material into channel corners, and a second guide element spaced from said second blade element to cause it to sever excess screening material as aforesaid.

11. Apparatus for forcing screening material into

frame grooves comprising a base, a frame support on said base, die assemblies on said base movable toward the edges of a frame on said support, locator means on said assemblies engageable with a screen frame on said support to locate the frame and die assemblies in correlated position, said die assemblies comprising die blocks movable relative to said locator means in a plane parallel to the plane of the frame, punches on said die blocks shaped to enter a screen receiving channel in the screen frame, and guide members associated with said punches including inclined camming portions engageable with the outer surfaces of the bars of the screen frame to guide said punches into the channels of the screen frame.

12. Apparatus as defined in claim 11 in which said die assemblies are movable diagonally inwardly into engagement with the corners of a frame, and said punches comprise angular blade portions shaped to enter channel corners of the frame.

13. Apparatus as defined in claim 11 in which said guide members are rigidly spaced from said punches to set up screen shearing action between said punches and the outer surfaces of the screen frame channels.

14. Apparatus as defined in claim 11 comprising hydraulic means operable initially to move said die assemblies against the frame and thereafter to move said die blocks toward the frame to insert the screen material into the frame channel and to trim excess material.

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