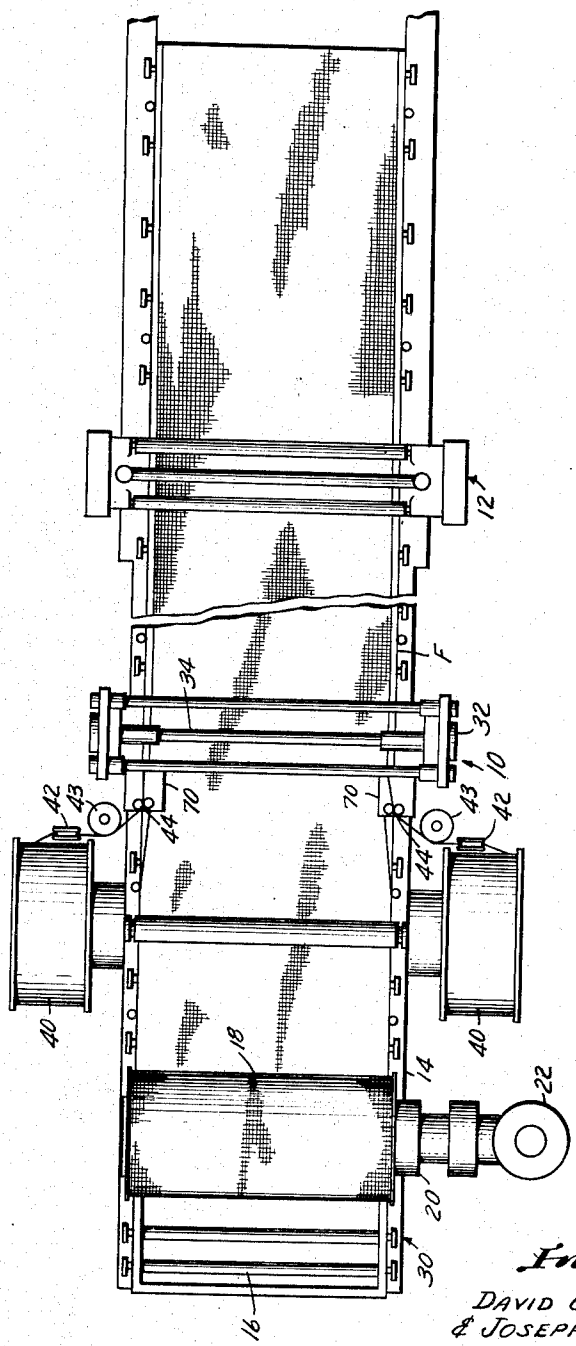
Nov. 30, 1954 D. G. JOHNSON ET AL 2,695,445

METHOD OF SCREENING FRAMES BY A CONTINUOUS PROCESS USING SCREENING ROLLS

Filed July 20, 1950 4 Sheets-Sheet 1

Fig. 1



Inventors
DAVID G. JOHNSON
& JOSEPH MAYER

BY Whittemore, Hulbert & Belknap Attorneys

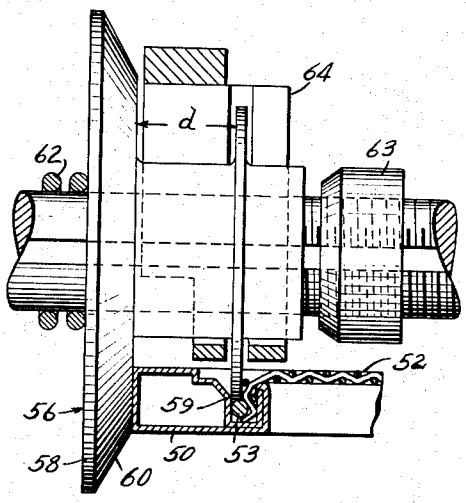
Nov. 30, 1954 D. G. JOHNSON ET AL 2,695,445

METHOD OF SCREENING FRAMES BY A CONTINUOUS PROCESS USING SCREENING ROLLS

Filed July 20, 1950

4 Sheets-Sheet 2

Fig. 2



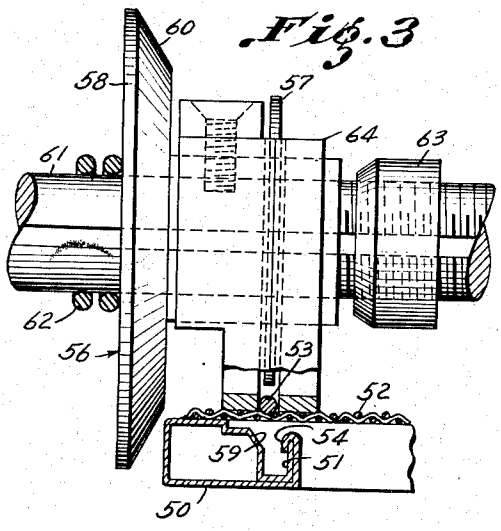


Fig. 3

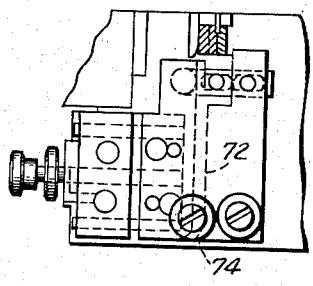


Fig. 6

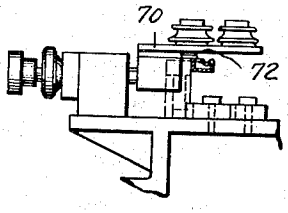


Fig. 5

Inventors
DAVID G. JOHNSON
& JOSEPH MAYER

By Whittemore, Hulbert & Belknap
Attorneys

Nov. 30, 1954 D. G. JOHNSON ET AL 2,695,445

METHOD OF SCREENING FRAMES BY A CONTINUOUS PROCESS USING SCREENING ROLLS

Filed July 20, 1950 4 Sheets-Sheet 3

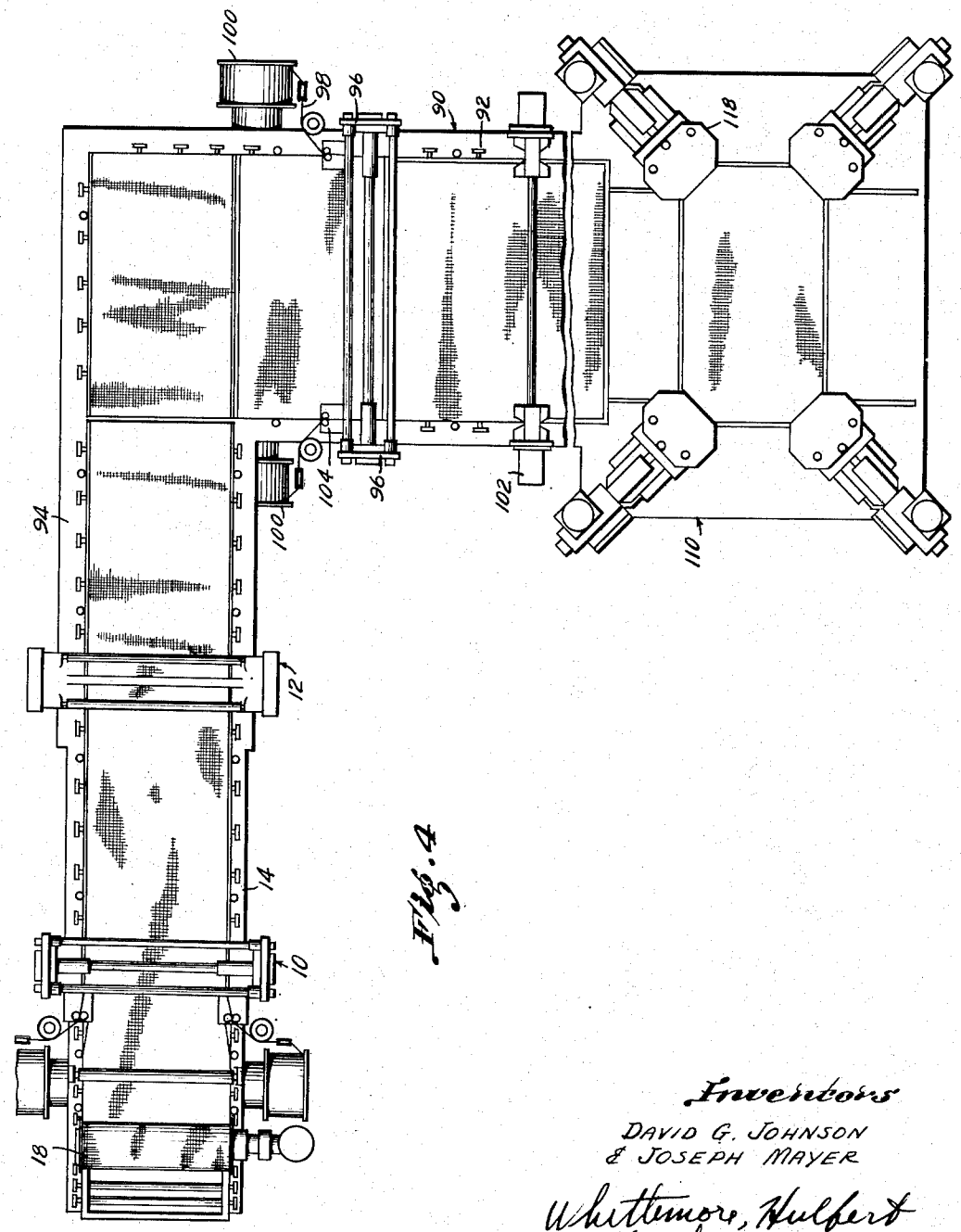


Fig. 4

Inventors
DAVID G. JOHNSON
& JOSEPH MAYER

BY Whittemore, Hulbert & Belknap
Attorneys

Nov. 30, 1954 D. G. JOHNSON ET AL 2,695,445

METHOD OF SCREENING FRAMES BY A CONTINUOUS PROCESS USING SCREENING ROLLS

Filed July 20, 1950

4 Sheets-Sheet 4

Fig. 7

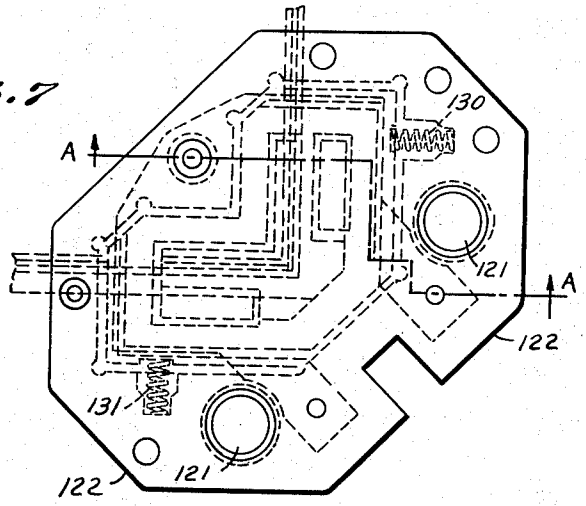


Fig. 8

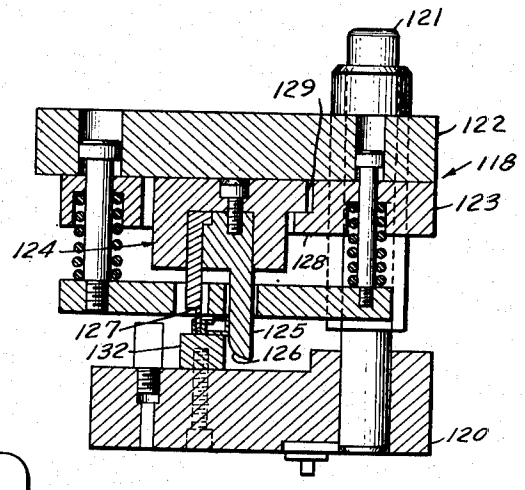
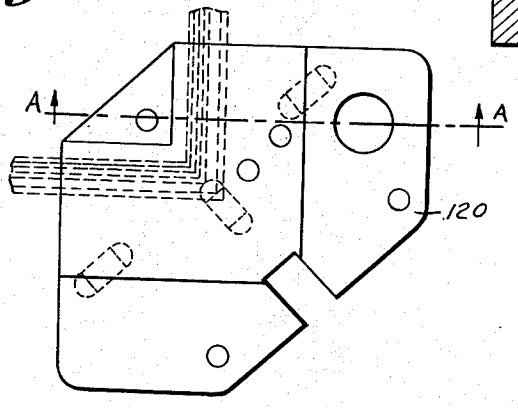


Fig. 9



Inventors

DAVID G. JOHNSON

& JOSEPH MAYER

By Whittemore, Hulbert & Belknap

Attorneys

United States Patent Office 2,695,445 Patented Nov. 30, 1954

2,695,445

METHOD OF SCREENING FRAMES BY A CONTINUOUS PROCESS USING SCREENING ROLLS

David G. Johnson, Erie, Pa., and Joseph Mayer, Detroit, Mich., assignors to Detroit Steel Products Company, Detroit, Mich., a corporation of Michigan

Application July 20, 1950, Serial No. 174,996

15 Claims. (Cl. 29—417)

The present invention relates to a method of applying screening material to screen frames. 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 continuation-in-part of our prior copending application, Serial No. 110,392.

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

It is a further object of the present invention to provide a method of applying screening material to frames which includes the step of automatically providing a predetermined slack in the screening material to be taken up during the subsequent mechanical application of the screening material to grooves or channels in the frame.

It is a further object of the present invention to provide a method of rolling screening material into two opposite sides of a frame simultaneously.

It is a further object of the present invention to provide a method in which screen frames may be advanced continuously, and screening material from a continuous supply, applied thereto and thereafter severed between adjacent frames.

It is a further object of the present invention to provide a method of applying screening material to screen frames which comprises applying a continuous strip of screening material to a succession of frames, and severing the screening material between adjacent frames so as to provide excess material for providing slack when the remaining two sides of the screen are processed.

It is a further object of the present invention to provide a method of pressing screening material and splining material into the intersecting corners of grooves or channels provided in the screen frame.

It is a feature of the present invention to provide a method of rolling screening material such as wire cloth into grooves or channels provided in screen frames by employing a roll having a peripheral flange adapted to enter the groove or channel in combination with a beveled guide shoulder on the roll, effective to apply shearing pressure between the flange of the roll and a corner of the frame channel.

It is a further feature of the present invention to provide a method of guiding a splining material, such for example as a suitable plastic material, substantially to the point where the flange of the guide roll enters the frame channel.

It is a further feature of the present invention to provide a method of positioning the screen frames, raising and lowering the screening rolls, and actuating the cutting knife for severing the screening material between adjacent frames.

It is a further feature of the present invention to provide a method of applying the screening material and/or splining material into the corners of the frames, in which direct application of a succeeding frame to the machine pushes the finished frame out of the machine in a simple sliding movement.

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 carrying out the method of applying screening material to two sides of a screen frame and for severing continuous screening material between screen frames.

Figure 2 is an enlarged fragmentary elevation showing the screening roll forcing the screening material and spline into a channel of a screen frame.

Figure 3 is a view similar to Figure 2 showing the manner in which the spline is guided into position beneath the flange of the screening roll.

Figure 4 is a more or less diagrammatic view illustrating the organization of apparatus for carrying out the complete method of producing completely screened frames.

Figure 5 is a fragmentary end view showing the mechanism for bunching the flexible screening material to provide fullness.

Figure 6 is a fragmentary plan view of the apparatus shown in Figure 5.

Figure 7 is a plan view of the top shoe of the die mechanism employed in carrying out the method of pressing the screening material into the corners of the frame.

Figure 8 is a composite sectional view of the mechanism shown in Figure 3, the upper part of the figure being a section taken on the line A—A, Figure 7, and the lower part of the figure being a section taken on the line A—A, Figure 9.

Figure 9 is a plan view of the bottom shoe of the die mechanism shown in section in Figure 8.

The present application is limited to the method of applying screening material to screen frames, claims to the apparatus being presented in prior copending application, Serial No. 110,392. However, the invention may be best understood by a complete description of a preferred form of apparatus for carrying out the method. Accordingly, the specific apparatus is fully disclosed herein. It will be observed that the method as defined is in part carried out automatically by the apparatus and in part by manual steps performed by the operator or operators.

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. According to the present invention, 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. 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.

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 splin-

ing 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.

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.

According to the present invention, mechanism is provided by means of which screen frames may be supplied with screening material in a manner characterized by the substantial uniformity of the product and the high production obtainable due to the rapidity with which the operation takes place.

In the succeeding description, the mechanism for carrying out the first, second and third operations will be discussed separately.

Referring now to Figure 1 the mechanism comprises a rolling machine **10** for rolling the screening material and splining material into the frame, and a cut-off machine **12** for severing the screening material between adjacent frames. The rolling machine **10** comprises a horizontal table **14** provided with a plurality of supporting rollers **16** on which a plurality of frames F advance.

The screening material is provided in the form of a continuous roll **18** supported on a shaft **20** extending laterally of the machine from a supporting column **22**. In order to accommodate frames of different widths, the left hand side of the rolling machine is stationary and means are provided for effecting transverse adjustment of the entire right hand side of the machine toward and away from the left hand side.

The right hand side of the rolling machine **10** comprises a suitable frame structure indicated generally at **30**, which may as illustrated be composed of welded structural elements. Mounted on the frame **30** for vertical movement relative thereto is a roll head **32**. A cross shaft **34** extends across the machine to the adjustable left hand side thereof.

Identical means for supporting and guiding the splining material are provided at both sides of the machine.

The splining material is mounted on rolls **40** and is drawn off from the rolls by the advance of the frames and passes around guide roll **42** and thence around other guide rolls **43**. Pairs of guide rolls **44** guide the splining material to the roll head.

The advance of the screen frames through the machine is accomplished by screen rolls later to be described, and accordingly power means are provided for effecting rotation thereof.

Referring now to Figures 2 and 3 the operation of the screening rolls will be described. In these figures a bar of the screen frame is indicated at **50** having a groove or channel **51** therein for the reception of the edge of the screening material **52** and the splining material **53**. It will be observed that the bar of the frame includes a turned over edge **54** which is adapted to cooperate in locking the edge of the screening and splining material in place. The screening and splining roll **56** comprises an annular flange **57** which is adapted to enter into the groove **51** and to force the screening and splining material into the groove. Moreover, the roll includes an abutment flange **58** which is adapted to engage the outer edge of the screen bar **50**. The dimension *d* between the adjacent edges of the flanges **57** and **58** is deliberately made equal to or somewhat smaller than the dimension between the outside of the screen frame bar and the adjacent inside surface of the groove **51**. Furthermore the channel of the frame includes a corner **59**. The arrangement of parts is such that as the flange **57** moves the screening and splining material into the groove **51**, it cuts off the excess screening material at the corner **59**.

The inner edge of the flange **58** is beveled, as seen at **60** and operates as a camming surface to guide flanges **57** into grooves **51**. For this purpose, roll **56** is splined to shaft **61** and is provided with spring **62** urging the roll toward stop nut **63**, which permits the roll to be cammed to the left as seen in Figure 3, against the action of spring **62**. In these Figures, the spline guide **64** is illustrated. It will be observed that the splining material **53** is retained in properly aligned position until just prior to engagement with the periphery of the flange **57** of the splining roll by the spline guide **64**.

As the screening material is forced by the screening rolls into the grooves of the frame, the operation tends to tension the screening material transversely of the frame. In order that a uniform and predetermined tension shall be maintained in the screening material, a bunching guide is provided as best illustrated in Figures 5 and 6. This buncher comprises a plate structure **70** presenting an inwardly facing groove **72**. At the approach side of this groove the plate flares outwardly as indicated at **74**. Accordingly, as the edge of the screening material is drawn past the flaring portion **74**, the edges are moved inwardly by a predetermined distance, thus establishing a predetermined amount of slack in the screening material transversely thereof. Obviously, the guide plates **70** will be constructed and adjusted so that the amount of slack thus provided will be taken up in the screening operation and a predetermined desired tension established in the screening material.

The cut-off machine is illustrated at **12** in Figure 1. The opposite sides of this machine are not relatively adjustable but the machine is designed to operate to sever the screening material and splining material between ad-

jacent frames, no matter what width of frames are being provided with screening material. However, means are provided for adjusting the cut-off machine longitudinally of the path of advance of the frames relative to the rolling machine in order to position the cut-off blade at the precise point where the space between the adjacent edges of screen frames comes to rest.

The motive power for advancing the frames through the cut-off machine is furnished by the screening and splining rolls previously described, the screen frames ahead of the frame under the rolls being pushed ahead by the frame in engagement with the rolls.

As the frames emerge from the first operation they are provided with individual sections of screening material rolled into two opposite grooves and short lengths of spline material extend outwardly beyond the ends of these two grooves.

Inasmuch as the tension set up in the screening material by the rolling operation may be substantial, it may have a tendency to bow the sides of the frame inwardly. In order to overcome this it may be desirable to provide the screen frame bars with a predetermined outward bow so that the inward bowing tendency in the tension of the screening material will merely correct this outward bow and the frame bars in the completed screen will be straight. However, if bars of the prefered rigidity are employed, this will not be necessary.

Referring now to Figure 4, a second machine generally indicated at **90** is provided whose function is to roll the edges of the screening material and appropriate splining material into the grooves at the other two sides of the screen frames. It will be recalled that the first machine has rolled the edges of the screening and splining material into two opposite sides of the screen frame and has thereafter severed the screening material and the splining material between adjacent frames. The second machine receives the frames so as to pass the unsecured edges of screening material beneath the screening and splining rolls.

The mechanism of the second machine is generally similar to the first machine and hence will not be described in detail.

The frame is advanced onto a second conveyor indicated generally at **92** disposed at right angle to the table **14** and is fed along the conveyor **92** beneath the screening rolls on the heads **96**. Additional splining material **98** is provided at this time from the supply rolls **100**. As the screens are advanced on the second conveyor **92** they reach spline severing devices **102** adapted to sever the spline between adjacent frames. Means for severing screening material is not required at this time since each frame as advanced along the second conveyor, has a separate portion of screening material applied thereto.

It is also necessary in this machine to provide some fullness or slack transversely of the screening material so that the screening material may have a predetermined desired tension after the rolling operation is completed. For this purpose, buncher guides **104** are provided, into which the edges of the partially attached screening material are inserted as the frame is fed to the machine. These guides will push the edges of the screening material inwardly to provide a predetermined slack therein which will be taken up by the rolling operation.

As the frames emerge from the machine for performing the second operation, the screening material will be rolled into the grooves provided at the four sides thereof throughout the major portion of the grooves, but it will not be rolled completely into the intersection of the corners inasmuch as the flanges of the screening rolls cannot enter these corners. Moreover, there will be short lengths of spline material extending outwardly from each groove beyond the corner. Accordingly, another operation is necessary to complete the screen.

It will further be understood that the screening rolls if desired, could be of larger diameter and have the rolling flange discontinuous and timed to roll the screening material fully into a corner at the end of a frame channel. This would avoid use of the third operation described herein. The machine for completing the screen by pressing the screening and splining material into the corners of the frame grooves and for severing excess screening and splining material is indicated generally at **110** in Figure 4.

Referring now to Figures 7, 8 and 9, the die head or corner press **118** comprises a bottom shoe **120** having a

pair of upstanding guide posts **121** carried thereby. Slidably mounted on the guide posts **121** is an assembly comprising a top shoe **122**, a guide plate **123**, and a die block **124**. The die block has secured thereto a guide member **125** having a beveled edge **126** and a punch **127**.

The punch **127** has a narrow flange portion shaped to enter into the groove or channel of the screen frame to force the screening material and splining material into the corners and to trim away the excess material. The die block **124** 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 **128** formed on the guide plate **123**, the die block having an outwardly extending flange **129** overlying the ledge **128** and cooperating therewith to retain the die block against the top shoe. The guide **125** is shaped to force the punch **127** to bear against the outer walls of the frame channel to sever excess screening material.

Compression springs indicated at **130** and **131** are provided urging the die block inwardly toward the center of the screen, but permit yielding as the beveled edges of the guide **125** engage the outside corners of the screen frame.

The bottom shoe **120** has a fixed die block **132** 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 as punch **127** enters the groove or channel.

The frames are advanced along the conveyor **92** to a position beneath the corner presses **118**. 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 and splining material.

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 that 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.

The drawings and the foregoing specification constitute a description of the improved method of screening frames by a continuous process using screening rolls 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. The method of applying flexible sheet screening material to close the opening in rectangular channeled screen frames which comprises providing a continuous strip of screening material overlying a channeled screen frame beneath a pair of rollers having flanges shaped to enter the channels of the frame to force screening material therein, lowering the rollers into the channels in rear of the leading cross bar of the frame, driving the rollers to advance the frame, and to draw screening material forwardly toward the rollers, raising the rollers as the trailing cross bar of the frame approaches the rollers, thereby arresting advance of the frame, manually positioning a second frame in rear of said first frame and pushing said first frame forwardly therewith to move the leading cross bar of the second frame beyond the rollers, lowering the rollers to roll screen into the channel of the second frame, and repeating the foregoing steps for each succeeding frame.

2. The method of applying flexible sheet screening material to close the openings in a series of channeled frames which comprises advancing a series of frames with screen overlying said frames along a first conveyor and beneath a pair of flanged screening rollers located at opposite sides of the conveyor, causing the flanges of the rollers to enter the channels at two sides of the frames to roll screening material therein, severing the screening material between adjacent frames, advancing the frames onto a second conveyor at right angles to the first conveyor, advancing the frames on said second conveyor beneath a pair of flanged screening rollers at opposite sides thereof, causing the flanges of the rollers to enter the remaining pairs of channels at the sides of the frames, further advancing the frames on the second conveyor away from the second pair of rollers and finally pressing the screening material into the corners of the channels.

3. The method of claim 2 which comprises arresting the advance of the frames after each rolling operation

and performing the screen severing and corner pressing operation while the frames are stationary.

4. The method of applying screening material to frames by passing the frames and material beneath a pair of rolls having peripheral flanges to force the edges of the screening material simultaneously into channels at opposite sides of the frames which comprises progressively reducing the spacing between opposite edges of the screening material immediately prior to rolling to provide a predetermined amount of slack to thereby determine the final tension in the screening material.

5. The method of applying flexible sheet screening material to close the opening in rectangular screen frames by passing the frames and screening material beneath a pair of rolls having peripheral flanges to force the edges of the screening material simultaneously into channels at opposite sides of the frames which comprises progressively providing a predetermined amount of slack transversely of the screening material prior to rolling to predetermine the final tension in the screening material, and providing a predetermined outward bow to the bars of the screen frame such that the final tension shall be just sufficient to straighten the bars.

6. The method of applying flexible sheet screening material to close the opening in rectangular metal frames having screen receiving channels extending along the bars making up the frame which comprises applying screening material in position overlying the frame with the edges of the screening material extending beyond the channels at opposite sides of the frame, pressing a pair of flanged, relatively axially movable rolls into the opposite channels to force screening material into the channels, forcing the flanges of the rolls to bear against the outer surface of the channel to set up a shearing action therebetween, and relatively moving said rolls along the channels to force screening material into the channels and to sever excess screening material at the outer edges of the channels.

7. The method of claim 6 which comprises driving the rolls directly to effect movement of the frames.

8. The method as defined in claim 4 in which the rolls are axially movable, which comprises the step of providing an outward bow to the bars of the frame prior to rolling, the amount of bow being related to the final tension of the screening material such that the tension thereof straightens the bars.

9. The method of applying flexible sheeting material to close the opening in rectangular metal frames having channels extending along the bars making up the frames, the channels terminating short of the ends of the bars and channels on adjacent bars being connected, which method comprises applying sheet material to overlie the frame with the edges of the sheet material extending beyond the channels at opposite sides of the frame, forcing edge portions of the sheet material into the channels at opposite sides of the frame adjacent the ends of the channels by pressing the flanges of a pair of flanged rollers into the channels adjacent the ends thereof, progressively forcing edge portions of the sheet material into the channels from adjacent one end to adjacent the opposite end thereof by relatively rolling the rollers longitudinally of the frame bars with the flanges thereof in the channels, and simultaneously trimming excess sheet material at the outer edges of the channels by forcing the flanges of the rollers to bear against the outer side walls of the channels.

10. The method of applying flexible sheeting material to close the opening in a series of rectangular metal frames having channels extending along the bars making up the frames, the channels terminating short of the ends of the bars and channels on adjacent bars being connected, which method comprises applying sheet material to overlie a first frame with the edges of the sheet material extending beyond the channels at opposite sides of the frame, forcing edge portions of the sheet material into the channels at opposite sides of the frame adjacent the ends of the channels by pressing the flanges of a pair of flanged rollers into the channels adjacent the ends thereof, progressively forcing edge portions of the sheet material into the channels from adjacent one end to adjacent the opposite end thereof by simultaneously advancing the frame and rotating the rollers with the flanges thereof in the channels, moving the rollers away from the first frame as the trailing cross bar thereof approaches the rollers, positioning a second frame beneath the continuous strip of sheet material behind the first frame, advancing the first and second frames in unison beneath the rollers until the leading cross bar of the second frame has passed the rollers, forcing edge portions of the strip of sheet material into the channels of the second frame adjacent the leading cross bar thereof by pressing the flanges of the rollers into the channels and repeating the foregoing steps for each succeeding frame.

11. The method as defined in claim 10 which comprises severing the sheet material between the trailing cross bar of one frame and the leading cross bar of the following frame while such cross bars are in juxtaposition to support the sheet material during the severing operation.

12. The method as defined in claim 10 which comprises driving the rollers in rotation to cause advance of the frame engaged thereby, and manually pushing each new frame into position for rolling and thereby pushing the previously rolled frame ahead to a position beyond the rollers.

13. The method of applying flexible sheet material to close the openings in a series of rectangular frames having channeled frame bars in which the channels of adjacent bars intersect and terminate at a corner, which comprises advancing a series of frames with continuous sheet material overlying the frames beneath a pair of flanged rollers, pressing edge portions of the sheet material into the leading ends of the channels at opposite sides of the frames by pressing the flanges of the rollers into the channels, progressively rolling the sheet material into the channels by maintaining the flanges of the rollers in the channels during advance of the frames, elevating the rollers as the trailing cross bar of one frame and the leading cross bar of the following frame pass beneath the rollers, severing the sheet material beneath adjacent frames, thereafter advancing the frames beneath a pair of flanged rollers with the cross bars at the other two sides of the frame in registration therewith, pressing edge portions of the sheet material into the leading ends of the channels at the other two sides of the frames by pressing the flanges of the rollers into the channels, progressively rolling the sheet material into the channels by maintaining the flanges of the rollers in the channels during advance of the frames, elevating the rollers as the trailing cross bar of one frame and the leading cross bar of the following frame pass beneath the rollers, and finally pressing the sheet material into the channel corners.

14. The method as defined in claim 13 which comprises shearing excess sheet material during the rolling operation by forcing the flanges of the rollers to bear against the outer walls of the channels.

15. The method as defined in claim 14 which comprises employing a punch to press the sheet material into the channel corners, and shearing excess sheet material from adjacent the corners of the frame by forcing the punch to bear against the outer walls of the channels.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
739,343	Peregrine	Sept. 22, 1903
783,786	Hoffman et al.	Feb. 28, 1905
1,556,234	Maise	Oct. 6, 1925
1,665,203	Delf	Apr. 10, 1928
1,714,468	Espenschied	May 21, 1929
1,734,710	Borchert	Nov. 5, 1929
1,832,524	Bosley	Nov. 17, 1931
2,108,638	Benedict	Feb. 15, 1938
2,144,570	Harrison	Jan. 17, 1939
2,158,656	Frank	May 16, 1939
2,190,611	Sembder	Feb. 13, 1940
2,200,605	Pierce	May 14, 1940
2,321,085	Hubbard	June 8, 1943
2,343,043	Brugman	Feb. 29, 1944
2,364,494	Upson	Dec. 5, 1944
2,371,816	Frank	Mar. 20, 1945
2,422,952	Dakin	June 24, 1947
2,450,987	Potter	Oct. 12, 1948
2,466,947	Harbord	Apr. 12, 1949
2,539,205	Rickley	Jan. 23, 1951
2,638,131	Rohs	May 12, 1953