United States Patent

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[73] Assignee **American Screen Process Equipment Company**
Chicago, Ill.

[54] **PNEUMATIC TENSIONING OF SCREEN STENCILS**
6 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **101/127.1,** 101/415.1
[51] **Int. Cl.** **B411 13/02,** B41f 27/04
[50] **Field of Search** 101/127.1, 415.1; 38/102.4, 102.5, 102.91; 69/19.3; 160/328, 329, 372, 378, 395; 92/34

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Primary Examiner—J. Reed Fisher
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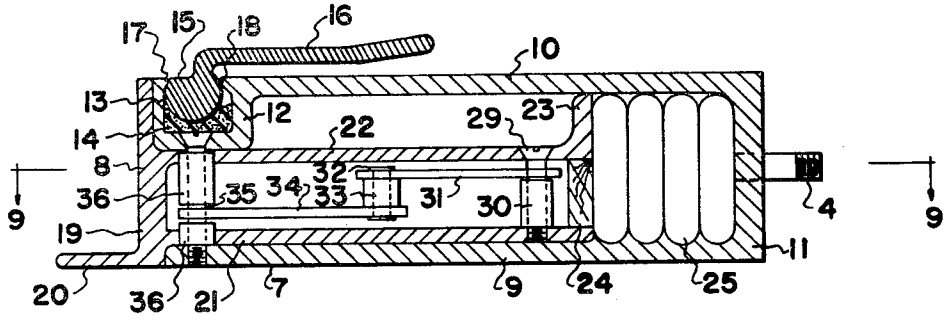
ABSTRACT: In the preparation of screen process stencils, a stencil frame is enclosed tightly by a pneumatically operated frame. The stencil screen is secured on two or four sides on the movable portions of the surrounding pneumatic tensioning frame. The pneumatic tensioning frame is then inflated uniformly with compressed air and extended to cause the screen to be tensioned uniformly in all directions. The screen is then tacked or stapled or otherwise fastened to the stencil frame and has the desired degree of stretch for stencil printing. The pneumatic tensioning frame comprises a plurality of pneumatically operated frame members having a fixed member engageable with the stencil frame and a movable member on which the stencil screen is secured for movement under pneumatic pressure. The pneumatic frame members are provided with a mechanical linkage for ensuring that the members maintain a parallel relation during movement under pneumatic pressure to prevent the frame from separating further at one end than at the other when only part of the frame is being used to tension a screen stencil. The movable portion of the pneumatic frame has a normal fabric locking arrangement comprising an elongated slot having a narrow necked opening and a rotatable cam lock bar for securing fabric in place.



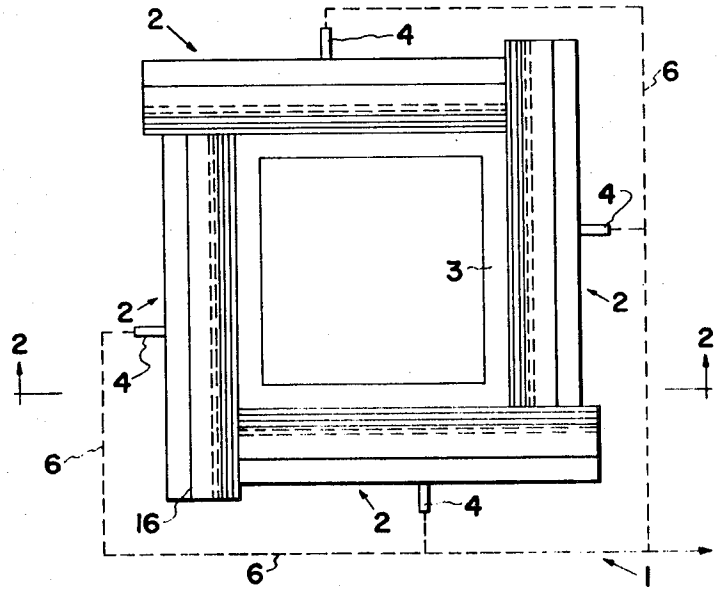


FIG. 1

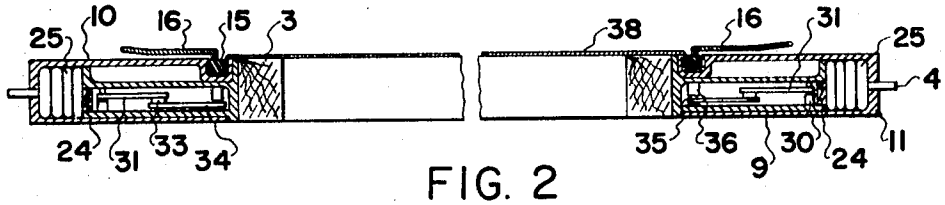


FIG. 2

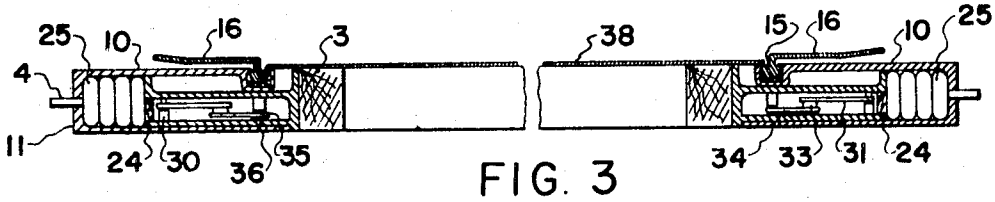


FIG. 3

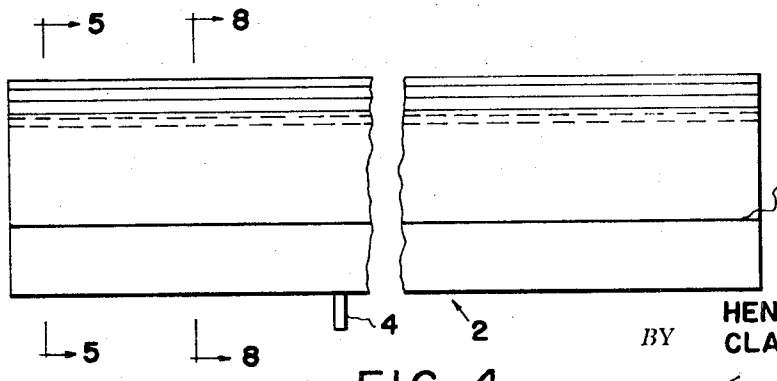


FIG. 4

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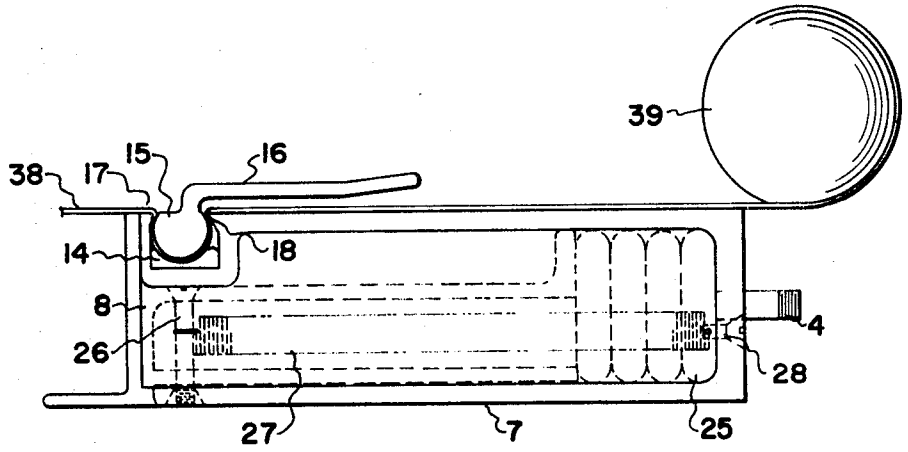

FIG. 5

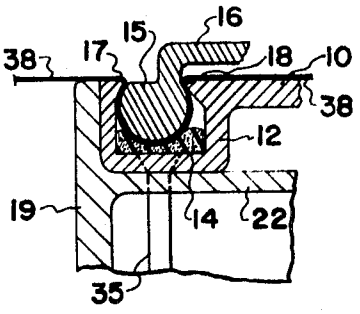

FIG. 6

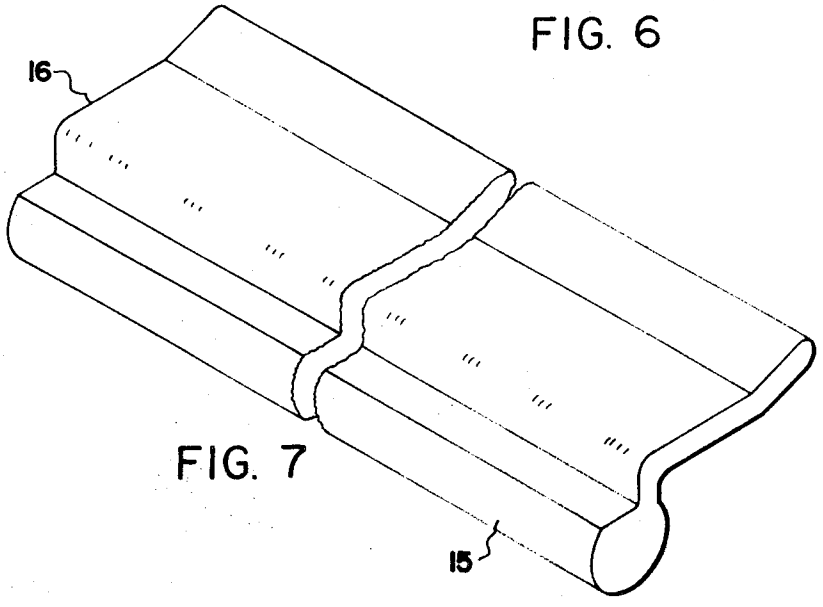

FIG. 7

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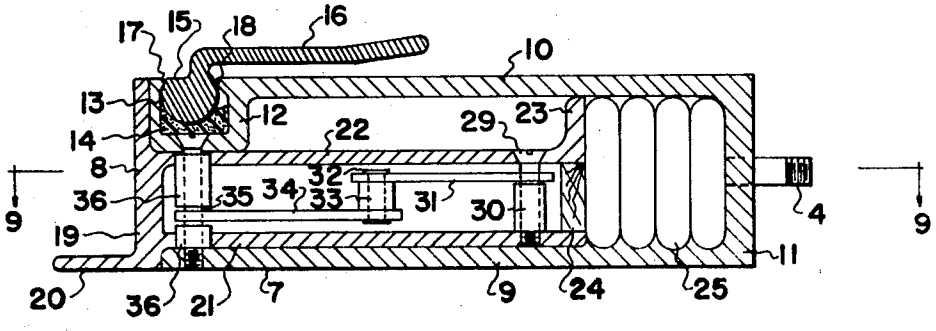

FIG. 8

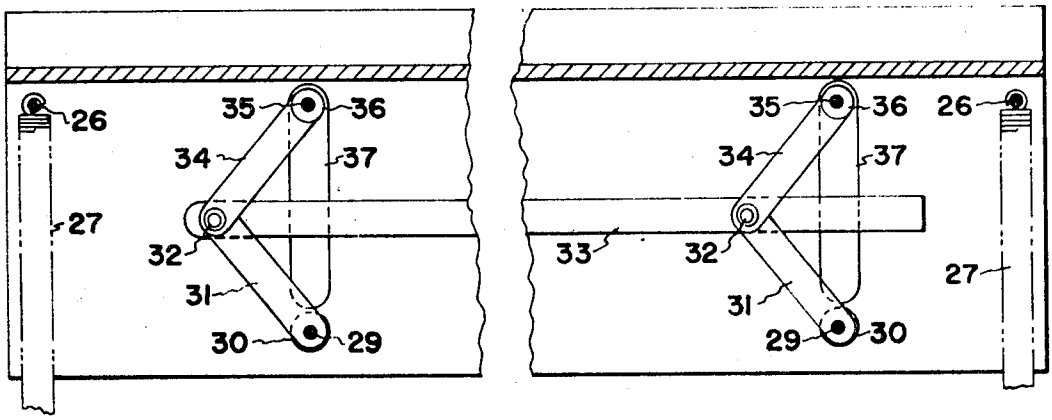

FIG. 9

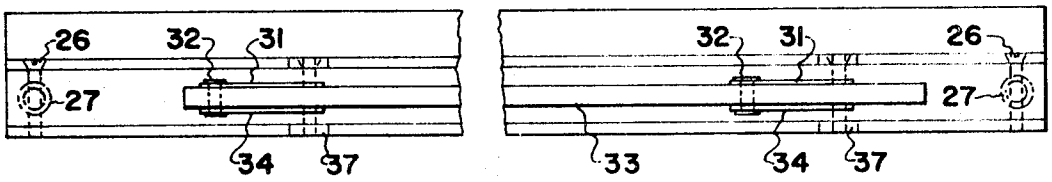

FIG. 10

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PNEUMATIC TENSIONING OF SCREEN STENCILS

CROSS-REFERENCE TO RELATED APPLICATION

This application discloses in part subject matter which is also disclosed in the copending application of Henry J. Bubley, Ser. No. 674,995, filed Oct. 12, 1967 now U.S. Pat. No. 3,541,957.

BACKGROUND OF THE INVENTION

In screen process printing, printing frame, usually of wood or metal, has a screen stretched tightly across it and secured around the entire periphery of the frame. The screen may be secured by tacks or staples or by a continuous cord or rope which secures the edge of the screen into a retaining groove on the frame and also assists in the tensioning of the screen. A suitable design is formed on the screen by conventional techniques. A suitable printing ink, usually a paste or thixotropic ink, is placed on the stencil and is forced through the stencil onto the printing stock by a rubber squeegee. When multicolor designs are used, the designs are applied using a different stencil for each color, with intermediate drying of the colors prior to application of the next color.

In the preparation of the screen process stencils, the tensioning of the screen at the time of application to the printing frame is of utmost importance. The screen fabric must be stretched properly on the printing frame in order to produce quality work. Badly stretched fabric causes blurred prints. As the squeegee moves across a poorly stretched screen, the fabric bunches up in front of the squeegee, thereby causing blurred prints. Also, the normal expansion and contraction of fabrics due to atmospheric conditions causes the registration of the screen design to vary. Poor stretching in slack screens allows even more variations in register. Slackness in fabrics on screen process stencils leads to early stencil breakdown because the stencil pattern is flexed excessively during the printing stages, thereby hastening cracking, drying, etc. Finally, it should be noted that most types of stencils, including adhering film and direct contact stencils and carbon tissue stencils, adhere more successfully when the fabric is very taut.

DISCUSSION OF THE PRIOR ART

The earliest methods of tensioning screen fabrics on prining frames used a strictly manual technique. The fabric would be tacked or stapled along one edge of the frame and stretched by hand to the other edge and tacked or stapled in place. This method had the disadvantage that tensioning of the fabric was not always uniform and did not permit a tensioning of the fabric in both directions on the frame. Another technique which has been used to a very great extent involves the use of stencil frames having peripheral retaining groove into which the edge of the fabric is secured by a cord or rope. The fabric is secured along one edge of the frame by rope secured in the peripheral groove. The fabric is then stretched manually and the rope hammered into the groove forcing the fabric to stretch as it is being secured in the groove. This technique has been very time consuming and does not provide the uniformity of tensioning in all directions which is needed. Furthermore, this technique does not permit the tensioning of screens for a number of different frames simultaneously.

There are a number of mechanical screen fabric stretching devices available which have attempted to solve some of the problems of stretching fabric uniformly in all directions. One commercial screen fabric stretcher uses two sets of parallel spacer bars extending at right angles to each other. The stretcher bars are mounted at their ends on worm gears which have handles for rotation. Rotation of one handle will cause two of the parallel spacer bars to move apart or advance toward each other. Rotation of the other handle will cause the the other pair of stretcher bars to be moved together or apart. When the screen fabric is fastened to four stretcher bars, which have been set to a size slightly larger than the printing frame, and the gear-rotating handles are turned, the stretcher bars move outward in each direction to stretch the fabric. This

apparatus is moderately effective but is very expensive and not easily available to small or even moderate size printing shops.

Another screen fabric stretcher which has been quite successful is the American-Omega screen fabric stretcher. This stretcher has a frame to which the screen fabric is secured. The printing frame is placed on under the fabric on adjustable corner supports which are arranged for movement by a rotary screw. Upon rotation of the screw at each corner of the stretcher frame, the printing frame is slowly advanced upward and presses against the screen fabric. When the printing frame is moved upward, the fabric is tightened in all directions. This screen fabric stretcher is quite effective and has been successful commercially but there is a slight tendency to tear the fabric when the frame is pressed upward. It is therefore necessary to use printing frames which have specially rounded corners and rounded edges to prevent the damage to the screen fabric. Another disadvantage of this type of fabric stretcher is that a substantial excess of the screen fabric is required which is wasteful.

The Robustina screen fabric stretcher, manufactured by the Italian firm, S. Robustelli, has four parallel stretcher bars two in each direction, which are arranged to be moved by a gear mechanism operated by a rotary handle. The stretcher bars are segmented and provide for connection to the fabric at separate points so that adjustments may be made in the amount of stretch at various points along the stretcher bar. For very large printing frames, the Italian firm, S. Robustelli, manufactures a large electrically operated fabric stretcher known as the Robusta. This fabric stretcher has parallel stretcher bars which handle frame sizes from 34 inches to 118 inches and up to 33 feet in length. The parallel stretcher bars which stretch the screen fabric in opposite directions are operated by a gear system driven by electric motors and controlled from a control panel at the end of the apparatus. This fabric stretcher apparatus, of course, is extremely expensive and is used only by very large screen process printers who print carpets and rugs and other very long pieces of fabric.

Recently, several attempts have been made to solve the problem of uniform stretching of screen fabrics by use of pneumatic apparatus. The devices which have been marketed commercially for this purpose, however, have been quite expensive and have been inflexible in their operation or have in some way produced a nonuniform stretching of the fabric. One pneumatic fabric stretcher is manufactured and sold by the French firm, Tripette and Renaud. This apparatus has a plurality of pneumatic units, usually 30 or 40 or more, which are arranged in fixed positions on a supporting cable and which are interconnected pneumatically for simultaneous operation. This apparatus is quite expensive and does not fit closely around the frame on which the fabric is being stretched (thus being wasteful of fabric). Also, in this apparatus, there is a discontinuity in the points of application of stretching force with the result that some portions of the fabric may be stretched more than others. Still another approach to the pneumatic stretching of screen fabrics is found in U.S. Pat. No. 3,391,635 consisting of a pneumatic fabric tensioner manufactured by M & M Research Engineering Company. This fabric tensioner consists of an elongated clamp for securing the edge of the screen which is mounted for movement by an air cylinder. The fabric stretcher comprises a plurality of separate units each arranged to secure a portion of the edge of the fabric being stretched and, upon operation of the air cylinders simultaneously, to stretch the fabric uniformly in all directions. This apparatus has the disadvantage of being very expensive, requiring high pressure to operate and not being flexible in terms of fitting. closely around the frames being equipped with fabric, particularly when there is a substantial variation in frame size. Another disadvantage, as in the case of the French pneumatic tensioning device, is that there is a discontinuity in the application of tension at points on the fabric between adjacent clamps.

STATEMENT OF OBJECTS AND FEATURES OF THE INVENTION

It is therefore one object of this invention to provide a new and improved apparatus for tensioning screen fabrics uniformly in all directions for application to a printing frame.

Another object of this invention is to provide a new and improved apparatus for pneumatic tensioning of screen fabrics uniformly around the entire periphery of the fabric.

Another object of this invention is to provide a new and improved pneumatic tensioning frame.

One of the features of this invention is the provision of an improved pneumatically operated tensioning frame which applies a tensioning force uniformly and continuously around a screen fabric and tensions the fabric uniformly in all directions.

Another feature of the invention is the provision of an improved pneumatically operated screen fabric tensioning frame comprising a plurality of frame members which are positioned in the form of a rectangular frame adjustable to any desired size and operable to apply a uniform tensioning force to a screen fabric secured therein.

Still another feature of this invention is the provision of an improved pneumatic frame component comprising a pair of frame members telescoped together and having an elongated pneumatic tube for operation, one of the telescoping members being provided with means for securing the edge of the fabric to be stretched and movable by inflation of the pneumatic tube to stretch said fabric.

Still another feature of this invention is the provision of an improved pneumatic frame component comprising a pair of frame members telescoped together and provided with a mechanical means to secure said members in parallel relation during movement and having an elongated pneumatic tube for operation, one of the telescoping members being provided with means for securing the edge of fabric to be stretched and including a longitudinally extending retaining groove and a cam lock bar operable to be positioned therein to secure the fabric.

SUMMARY OF THE INVENTION

This invention comprises a new and improved pneumatic tensioning or stretching frame assembly for screen fabrics. More particularly, the invention comprises a pneumatic frame assembly having a plurality of frame members positioned in the form of a frame around a screen process stencil frame and having movable portions to which the screen fabric is secured and which are operated pneumatically to tension or stretch the fabric in preparation for assembly of the fabric on the screen stencil frame.

The individual pneumatic frame components comprise extruded members which telescope in assembly and which are arranged for actuation by a pneumatic tube.

A mechanical linkage is provided interconnecting the frame components to ensure that the components maintain a parallel relation during movement. The fixed member of the pneumatic frame is provided with a flange extending outward to support the screen stencil frame. The movable member of the frame is provided with an elongated slot into which the fabric is secured by a cam lock bar having a laterally extending flange functioning as a lever for rotation of the bar to secure fabric in position and to prevent the bar from rotating and releasing the fabric during tensioning movement. Upon inflation of the pneumatic tube, the movable member is moved outward. The arrangement of the frame members compactly around one or more printing frames on which the fabric is to be stretched makes possible the uniform stretching of the fabric in all directions and facilitates the attachment of the stretched fabric to the printing frame, all with a minimum waste of screen fabric.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, to be taken as a part of this specification, there is clearly and fully illustrated a preferred embodiment of the invention, in which drawings,

FIG. 1 is a plan view of a pneumatically operated screen fabric stretching frame representing a preferred embodiment of this invention,

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1 and showing the connection of the fabric to the tensioning frame and its relation to the printing frame,

FIG. 3 is a sectional view of the apparatus as shown in FIG. 2 with the tensioning members of the frame moved to an actuated position,

FIG. 4 is a plan view of one of the pneumatic frame members, slightly enlarged in relation to FIG. 1,

FIG. 5 is a sectional view taken on the line 5—5 of FIG. 4 showing the relationship of one of the pneumatic frame members to a roll of screen stencil fabric being secured therein for tensioning,

FIG. 6 is a detail sectional view showing the point of connection of the screen fabric to the movable portion of the pneumatic tensioning frame,

FIG. 7 is a detail isometric view of a cam lock bar used to secure the fabric in the frame and shown in end view in FIG. 6,

FIG. 8 is a sectional view taken on the line 8—8 of FIG. 4 showing certain operating features of the pneumatic tensioning frame,

FIG. 9 is a sectional view taken on the line 9—9 of FIG. 8 and showing the mechanism for maintaining the tensioning frame members in parallel relation during movement, and

FIG. 10 is a view in right elevation of the fixed frame member portion shown in FIG. 8 and showing in end elevation the mechanism for maintaining the frame members in parallel relation during movement.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings by numerals of reference, more particularly FIGS. 1–7, there is shown a pneumatically operated tensioning frame assembly 1 which comprises a plurality of pneumatic frame members or modular stretcher units arranged in square or rectangular form surrounding the screen printing frame or permanent frame 3. Pneumatic frame assembly 1 is preferably arranged with the pneumatic frame members 2 abutting the entire periphery of printing frame 3. It should be noted, however, that in large printing frames of this type which handle stretching of fabric for a number of stencils frame members may not abut all of the printing frames. Also, in some cases, only two of the pneumatic frame members 2 may be positioned on opposite sides of stencil frame 3 to stretch fabric thereon. The pneumatic frame members 2 are each provided with one or more valve stems 4 which are connected by suitable conduits or hoses, illustrated diagrammatically as dotted lines 6 in FIG. 1, to a source of compressed air.

In FIG. 2, the use of the frame in stretching or tensioning a screen fabric over a printing frame is seen in more detail. A screen fabric 38 which may be silk, nylon, polyester, teflon, stainless steel, etc., is secured in a movable portion of the frame members 2 when the printing frame (herein shown as a wooden frame) is positioned adjacent the fabric for ease of attachment thereto. When compressed air is supplied to the pneumatic frame assembly, i.e. to each of the pneumatic tubes in the several pneumatic frame members, the moving portion of the pneumatic frame members 2 moves outward as shown in FIG. 3 to tension or stretch screen fabric 38. In this stretched position, the fabric may be attached to frame 3 as by staples or other suitable fastening means, such as tacks, cement or glue, or rope or cord securing the screen in a peripheral groove on the printing frame.

The pneumatic frame members 2 are substantially identical and their construction and assembly and operation will be understood more fully by reference to FIGS. 4–10 of the drawings. Since the frame members are essentially duplicates of each other, only one of them will be described.

Frame member 2 comprises two elongated extruded members 7 and 8 which are of approximately U-shaped cross section (as seen in FIGS. 2, 3, 5 and 8). Extruded member 7 has a lower flange 9 and upper flange 16 extending from end wall 11. Upper flange portion 10 terminates in end portion 12 which is formed to provide an elongated groove 13. Groove 13 is provided with an elastic material such as a sponge member 14 along its entire length. The upper end of groove 13 provides a narrow-necked opening defined by rounded lip portions 17 and 18. A cam lock bar 15 is arranged to be positioned in groove 13 and has a flange portion 16 extending laterally therefrom to provide a lever for rotation of said bar.

Extruded member 8 has an end wall 19 from which there extends a flange 20 which supports screen frame on which the fabric 38 is being stretched. Extruded member 8 has lower flange portion 21 and upper flange portion 22 extending from upwardly extending wall 19. Upper flange portion 22 is provided with an end wall flange 23. A spacer block 24, preferably of wood, is positioned between flange portions 21 and 22 to secure members 8 and 9 against relative vertical movement. Spacer block 24 extends for substantially the entire length of frame member 2 and urges end wall flange 23 against the under surface of upper flange member 10 of extruded member 9.

Members 8 and 7 move telescopically with flange member 7 sliding along flange member 21 and end portion 12 sliding along flange member 22 while the undersurface of flange member 10 slides over end wall flange 23. In the space between the end wall which is defined by flange wall 23 and spacer block 24 and end wall 11 of extruded member 7, which runs longitudinally for the entire length of frame member 2, there is positioned a rubber inner tube 25 which is provided with valve stem 4 for application of pressure thereto. In practice, the tube 25 is an elongated resilient tube which is folded four times within the space for multiplication of the expansive force exerted by air pressure within the tube. The tube 25 may be provided with a cord (not shown) disposed internally extending through its entire length so that when it is folded back and forth upon itself a continuous air path is provided along the cord so that the tube is not pinched off at the folded ends which would prevent inflation of all folds.

At opposite ends of frame members 2 there are provided screw connectors 26 and 28 between which there is positioned and supported a spring member 27. Spring member 27 provides a spring force at each end of frame member 2 urging extruded members 7 and 8 toward the position shown in FIGS. 2, 5 and 8.

The frame members 2 are provided with a mechanism for maintaining extruded members 7 and 8 in parallel relation during movement thereof by pneumatic tube 25. This mechanism is illustrated more clearly in FIGS. 8, 9 and 10. The mechanism for maintaining the extruded members 7 and 8 in parallel relation during movement thereof by pneumatic tube 25. This mechanism is illustrated more clearly in FIGS. 8, 9 and 10. The mechanism for maintaining the extruded members 7 and 8 in parallel relation is necessary to prevent them from opening at an angle under pneumatic pressure when only part of the length of the tensioning frame is being used for tensioning fabric. In FIGS. 8 and 9 there is shown a bolt member 29 which extends between flange portions 21 and 22 and is surrounded by a spacer member 30. Bolt member 29 has lever arm 31 pivotally connected thereon at one end and has its other end pivotally connected to pivot rod 32 which extends through one end of linkage bar 33. Another pivot arm 34 is connected at one end of linkage bar 33. Another pivot arm 34 is connected at one end to rod 32 and at its other end to bolt member 35. Bolt member 35 is provided with roller members 36. Extruded member 8 is provided with two pairs of parallel slots 37 in upper flange member 22 and lower flange member 21. The bolt member 35 extends from the bottom of groove 13 in end portion 12 of extruded flange portion 9. Roller members 36 ride in slots 37 and cause the movement of the flange members to be maintained in a parallel relation.

From the views seen in FIGS. 8, 9 and 10 it is seen that the rigid (but pivotal)interconnection of arms 31 and 34 and linkage 33 cause the movement of roller 36 to always be maintained in a perfectly parallel relation in slots 37. As a result, when pneumatic tube 25 is inflated, if only part of the frame is being used for tensioning fabric the portion which is unopposed and which would normally tend to separate further apart will apply a force through the linkage mechanism which will cause the members to be maintained in a parallel relation. With the linkage illustrated in FIGS. 8, 9 and 10 it is not possible to move the extruded members 7 and 8 apart without maintaining a continuous parallel relation.

In FIG. 6 there is shown a detail view, on a slightly enlarged scale in relation to the other figures, of the retaining groove for holding the screen fabric in position for stretching or tensioning. Fabric 38 (which is supplied from a bolt or reel 39) is positioned in groove 13 and an elongated cam lock bar is positioned in the groove to hold the fabric tightly therein. Cam lock bar 15 is preferably a rod or bar of substantially circular cross section having an elongated flat portion machined along its entire length. The dimension of bar 15 across a diameter which intercepts the midpoint of the flat portion is slightly less than the necked opening in groove 13.

Cam lock bar 15 has a flange 16 welded or otherwise secured thereon and extending essentially in a plane parallel to the machined flat on the surface of the bar. Flange 16 is turned up slightly at its outer edge and functions as a lever for rotation of bar 15. Cam lock bar is normally held by flange 16 on edge for insertion through the narrow-necked opening to groove 13 and is rotated by lever flange 16 to the position shown in FIGS. 6 and 8 to secure fabric 38 tightly therein. Fabric 38 is secured by sponge or elastic member 14 pressing cam lock bar 15 tightly against the rounded necked portions 17 and 18 at the top of the groove 13. Lever flange member 16 prevents bar 15 from rotating further in a clockwise direction (as viewed in FIGS. 5, 6 and 8) during tensioning operation of the frame, which rotation would otherwise allow the bar to pull out the retaining groove.

The assembly and operation of the pneumatic frame and individual frame members 2 should be apparent from the description of the various components. The assembly and operation, however,, will be repeated in slightly more detail for a more thorough understanding of the invention.

OPERATION

In assembling the pneumatic frame members 2 the linkage mechanism consisting of bolts 29, spacers 30, linkage bar 33 and pivot arms 31 and 34 and pivot pins 32 are secured between flange members 21 and 22 as shown in FIG. 8 and spacer block 24 is placed in position. Next, extruded member 8 is inserted inside extruded member 7 as shown in FIG. 8 and bolts 35 and rollers 36 are secured in position with the rollers arranged for movement in slots 37.

Pneumatic tube is folded back and forth upon itself several times and is positioned as shown in FIG. 8 with valve stem 4 extending through end wall 11. Sponge material or other elastic material 14 is positioned in the bottom of groove 13 and cam lock bar 17 is provided for securing fabric for tensioning.

When the pneumatic frame members 2 are assembled as shown in FIGS. 5 and 8, they may be formed into square or rectangular stretching or tensioning frame assemblies as illustrated in FIG. 1 or may be used in pairs to stretch fabric only in one direction. The frame assemblies which are formed do not require the individual frame members to be secured to each other since the pneumatic operation of the frame components causes them to fit tightly around the object for which the screen fabric is to be tensioned. In FIG. 1 there is shown a plan view with four of the frame members positioned around a square printing frame in preparation for tensioning a fabric thereon. If a longer or larger frame is to have the fabric tensioned, two or more of the frame members may be positioned

end to end. Also, the tensioning frames can be positioned around more than one of the screen process frames for tensioning a larger area of fabric to be secured to the indiviaual frames.

In the embodiment shown in FIG. 1, the frame members are positioned around and abut tightly against printing frame 6 which is supported on flange members 20 of each of the pneumatic frame members. Stencil screen material 38 is removed from bolt or reel 39 and is secured in each of the surrounding grooves 13 in the separate pneumatic frame members. The cam lock bars are inserted with the lever portion 16 held in a vertical direction and pressed tightly into the sponge or elastic material and then rotated to the position shown in FIGS. 5 and 8. In this position, the sponge or elastic material 14 presses cam lock bar 15 to hold the fabric tightly against the rounded necked opening.

When pneumatic pressure is applied to pneumatic tubes 25 in each of pneumatic frame members 2, uniform pneumatic force is applied in each of the frame members causing movable extruded part 7 to move outward as viewed in FIG. 1. This applies a uniform and continuous outward stretch in all directions to fabric 38 which is stretched over printing frame 3. Only a small amount of air pressure is ordinarily required. A pressure of 5–20p.s.i. will produce a stretching force equal to prior art devices requiring pressures of 50—200 p.s.i. The expansion of the pneumatic frame is illustrated in FIG. 3 where the movable members have moved outward to tension the fabric 38. As was described in the assembly of the pneumatic frame members, the linkage comprising arms 31 and 34 and linkage 33 and the various supporting bolts, connecting pins and rollers and the parallel slots 37 in which rollers 36 move, cooperate to ensure that the movable portion of each of the pneumatic frame members always moves in parallel relation to the fixed member of the frame.

When the fabric is tensioned or stretched to the desired degree, usually determined by the amount of air pressure applied to pneumatic tubes 45, the fabric is then secured on printing frame 3 by tacks or staples or by any other suitable securing means, such as cord or rope securing the stencil screen in the peripheral grooves on the printing frame.

While this invention has been described fully and completely with special emphasis on a preferred embodiment, it should be understood that within the scope of the attended claims, the invention may be practiced otherwise than as specifically described herein.

We claim:

1. A pneumatic frame member for stretching screen fabrics comprising a first elongated member adapted to be positioned in a fixed location as part of a frame, a second elongated member guided on said first member for lateral movement thereon and including means for securing a fabric thereon, a mechanical linkage interconnecting said first and second members and guiding said second member for movement in a continuous parallel relation to said first member, and pneumatically operated means for moving said second member relative to said first member, one of said members being hollow and the other of said members being guided in said one member, said pneumatically operated means including an inflatable pneumatic tube positioned in said one member and operable upon inflation to move said other member relative to said one member, said second member being provided with an elongated groove adapted to receive screen fabric therein, an elongated cam lock bar adapted to fit in said groove to secure screen fabric in place therein, said fabric-retaining groove including an elastic material positioned along the bottom thereof and a necked opening at the top, said cam lock bar being of a dimension to permit insertion through said necked opening in one position and secured tightly by said necked-in groove upon rotation to another position.

2. A pneumatic frame member as defined in claim 1 in which said elongated cam lock bar comprises a rod having a laterally extending flange for rotation of the same from a position passing through said necked opening to a position wherein said bar is secured tightly in said groove and engaging the top of said second member to prevent rotation of said bar to a position permitting the same to be removed from said necked opening as a result of tensioning movement.

3. Tensioning means for uniformly tensioning porous fabrics and the like preparatory to fastening to a permanent frame, said tensioning means comprising a first elongated member positioned in continuous abutting relation with said permanent frame, a second elongated member telescopically interfitted with said first member and being adapted for movement relative thereto, said elongated members forming an elongated chamber, one side of said chamber being formed by one of said elongated members and the other side being formed by the other of said elongated members, linkage means interconnecting said first and second members for limiting movement of said first and second members for limiting movement of said first and second members in relative parallel relation, means on one of said members for continuously gripping said fabric along the length of said one of said members, and an inflatable member disposed in said chamber and extending substantially the full length of said chamber, said inflatable member being in contact with respective sides formed by said elongated members, an air inlet means to permit inflation of said inflatable member to move said second member relative to said first member to thereby tension said porous fabric.

4. The screen-tensioning apparatus of claim 3 wherein said means for gripping said fabric includes a continuous longitudinal channel opening upwardly and extending substantially the length of said modular unit and a longitudinally continuous locking bar disposed in said channel, said locking bar being of greater width than the opening of said continuous channel when said locking bar is in the locked position.

5. The tensioning means for porous fabrics as defined in claim 3 including spring means having opposite ends thereof interconnecting said first and second elongated members to urge the same in telescoping relation in the absence of pressure in said inflatable member.

6. The fabric-tensioning arrangement as defined in claim 3 wherein said means for securing said fabric on one of said members includes an elongated groove having a necked-in opening at the upper margin thereof, a continuous locking bar received in said groove and being rotated to a position wherein the transverse dimension is greater than said necked-in opening, said fabric being interposed between said locking bar and said necked-in groove, said locking bar being rotatable to a position wherein the transverse dimension is less than said necked-in portion of said groove to permit quick release of said fabric therefrom.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,608,484 Dated September 28, 1971

Inventor(s) Henry J. Bubley, et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 17, "the"should read -- this --. Column 3, line 42, insert the following paragraph -- Other objects and features of this invention will become apparent from time to time throughout the specification and claims as hereinafter related. --. Column 4, line 42, after "units" should read -- 2 --. Column 5, cancel lines 53-55; line 56, cancel "9 and 10."; lines 66 and 67 delete "Another pivot arm 34 is connected at one end of linkage bar 33."; line 73, after "extruded" should read --member 7 through slots 37 and into extruded --. Column 6, line 39, after "out" should read -- of --. Column 8, lines 28 and 29, delete "for limiting movement of said first and second members".

Signed and sealed this 24th day of October 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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