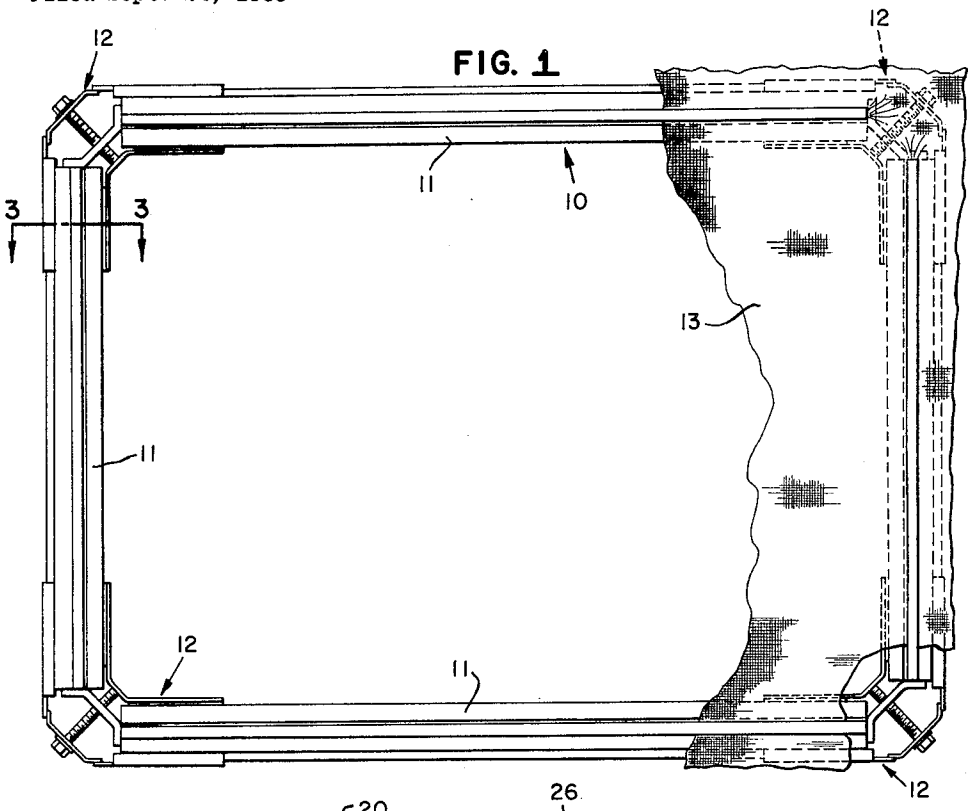
Jan. 25, 1966 P. J. DE GROOT 3,230,872

EXPANDABLE FRAME FOR SILK SCREEN

Filed Sept. 24, 1963 2 Sheets-Sheet 1

FIG. 1



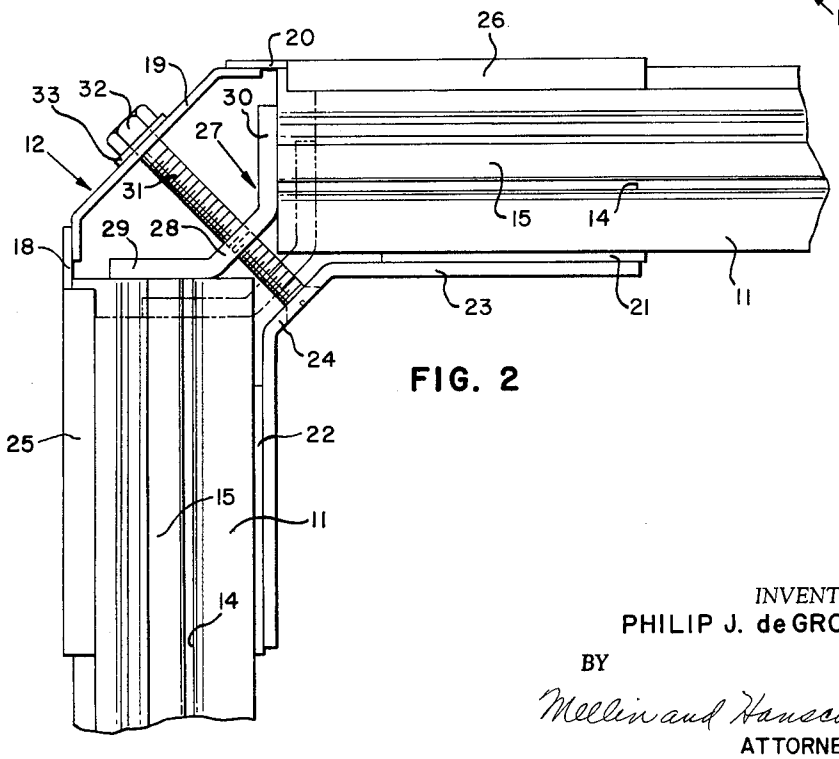


FIG. 2

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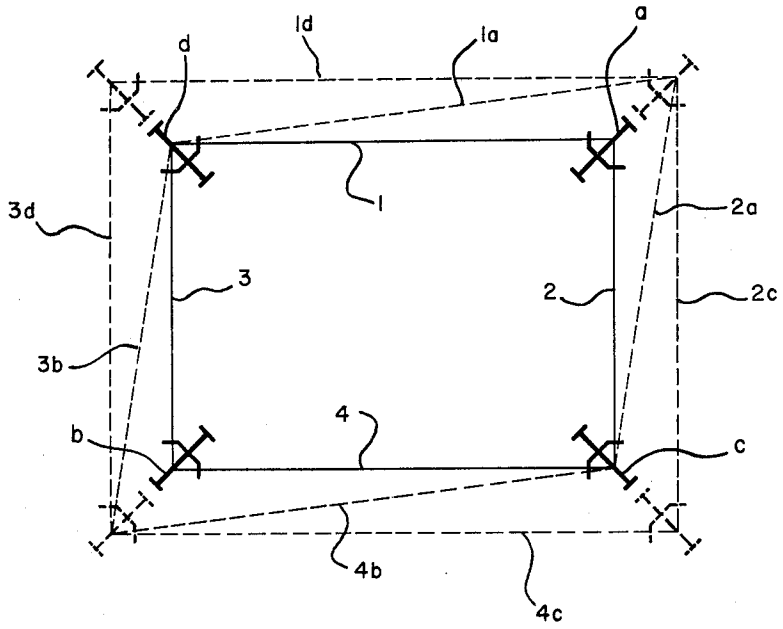

FIG. 4

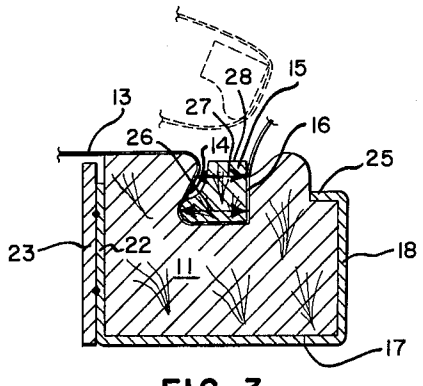

FIG. 3

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EXPANDABLE FRAME FOR SILK SCREEN

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2 Claims. (Cl. 101—127.1)

This invention relates to an expandable or adjustable frame, especially a frame that may be used for stretching a silk screen of the type employed in silk screen printing.

The use of adjustable frames for mounting silk screens is, of course, well known to persons familiar with the art of silk screen printing. Conventional frames of this type usually comprise a pair of inner and outer frames, the inner frame comprising separately adjustable members disposed parallel to corresponding fixed members of the outer frame. A silk screen is secured to each of the adjustable inner frame members, and an adjustment of the inner frame members in the direction of respective parallel outer frame members will then produce a tensioning or stretching of the screen. Two or more screws or bolts are normally used to effect a movement of each inner frame members relative to its parallel outer frame member.

Although conventional frames, such as the kind described, are satisfactory for tightening the screen, they usually require careful adjustment of each of the inner frame members to insure that the corners are properly stretched. Moreover, since several screws or bolts must be operated to effect an adjustment of any one inner frame member, it is not easy to stretch a silk screen from each of four inner frame members with equal tension at all four corners.

In brief, the present invention involves an expandable frame comprising a plurality of frame members having generally rectangular cross-sections held together in end-to-end relationship by four corner guide brackets and the sheet of material (or silk screen) that is being stretched. Each corner bracket defines a pair of convergent U-shaped passages which receive the ends of two frame members, respectively, and having a movable abutment located at the intersection of its passages. Each abutment is threadably mounted on a screw member which, when turned, causes its abutment to be moved into engagement with the ends of the frame members, thereby causing them to be moved along the U-shaped passage within which it is received and extended relative to the corner bracket. Thus, the frame is expanded and the silk screen stretched between frame members by sequential operation of four screw members, which produces a corresponding movement of their abutments.

One principal object of this invention is, therefore, to provide an expandable frame comprised of frame members and improved corner brackets, each having a pair of U-shaped passages for receiving the ends of two frame members and a movable abutment for adjustably sliding those members relative to its passages.

Other objects are to provide: an expandable frame having few operating parts; a frame which may be manufactured at a reasonable cost; a frame that may be used to stretch a silk screen with uniform tension forces at each of its corners; and a frame which is easy to operate.

Additional objects of this invention will become apparent in view of the following detailed description and the accompanying drawings.

In the drawings forming a part of this application and in which like parts are identified by like reference numerals throughout the same,

FIG. 1 is a plan view illustrating a preferred embodiment of the invention in an expandable framework;

FIG. 2 is an enlarged detail of a portion of the framework shown in FIG. 1, illustrating one corner bracket and the complementary relationship of two frame members;

FIG. 3 is an enlarged section taken on lines 3—3 of FIG. 1; and

FIG. 4 is a diagrammatic illustration showing the manner in which the expandable frame is enlarged.

Referring to FIG. 1, framework **10** comprises four identical frame members **11**, which are joined end-to-end by identical corner brackets **12** and held together by a piece of material **13** stretched between members. Frame members **11** possess a generally rectangular cross-section and are formed with a groove **14** fitted with a locking strip **15**. Each locking strip is matable with its respective groove **14** together with one edge of sheet material **13**, in a manner best shown in FIG. 3. It will be noted that the shapes of grooves **14** and locking strips **15** are such that a stretching of material **13** across framework **10** will not dislodge the strips from their respective groove. Furthermore, and with reference to FIG. 3, a stretching of material **13** tends to produce a clockwise rotation of strips **15** in the groove **14**, thereby clamping the material with increased pressure in the area indicated by reference number **16**.

The clamping action is a critical feature of the design shown. The cross section of groove **14** is designed with an interior dimension perpendicular to its length and parallel to the sheet material, in excess of the similar exterior dimension. With reference to FIG. 3, the interior dimension referred to is shown at **26**. Dimension **26** is perpendicular to the length of groove **14** (the length is apparent when viewing FIGS. 1 and 2) and is parallel to the plane defined by the portion of sheet material **13** that is stretched between the frame members (see FIG. 1). Dimension **26** is greater than similar exterior dimension **27** shown in FIG. 4.

Locking strip **15** is provided, as shown in FIG. 3, with a cross section similar to the cross section of groove **14** and somewhat smaller. The cross-sectional dimension of strip **15** is less than the cross-sectional dimension of groove **14** so that locking strip **15** may be accommodated within groove **14** with the sheet material **13** in between (see FIG. 3). Thus the tolerance between locking strip **15** and groove **14** is approximately equal to the thickness of the sheet material **13**.

Sheet material **13** is placed between locking strip **15** and groove **14** as shown in FIG. 3. Surface **28** of locking strip **15** is exposed, and sheet material **13** is stretched to the left (as viewed in FIG. 3), which tends to rotate locking strip **15** in a clockwise direction about it longitudinal axis.

Corner brackets **12** are made from metallic sheet material and shaped with a bottom portion **17** and perpendicular sides **18**, **19**, **20**, **21** and **22**. Sides **18** and **22**, together with bottom portion **17**, define a U-shaped passage which receives the end of one frame member **11**. Similarly, upstanding sides **20** and **21** defines a U-shaped passage that receives the end of a second frame member **11**. Sides **21** and **22** are interconnected and backed by a generally L-shaped bracket **23** having a flat corner portion **24**; sides **18**, **19** and **20** are connected, as by spot welding overlapping edges.

Retaining edges **25** and **26** which extend along and partially above respective U-shaped passages are provided integrally with the upper edge of sides **18** and **20**, respectively, as shown in FIG. 3. Each edge engages the top surface and shoulder of the frame members, thereby confining said members within the U-shaped passages but allowing movement of the members along said passages.

In view of the above description, it will be evident that each corner bracket **12** slidably receives the ends of a pair

of frame members **11**. Moreover, the opposite ends of each frame member **11** are held within generally aligned passages of a pair of corner brackets **12** by sheet material **13**, which are secured between members **11** on opposite sides of frame **10** by locking strips **15**.

Referring to FIG. 2, a movable abutment **27** is disposed at the intersection of each pair of convergent U-shaped passages. Abutments **27**, which define angle plates, have a center portion **28** and a pair of side flanges **29** and **30**, each side flange having a contact surface that extends in a plane perpendicular to the contact surface of the other flange. Each contact surface is also perpendicular to the axis of the frame member which it abuts. Center portion **28** is formed with a threaded opening that receives a screw member **31**, said member being rotatably supported between side **19** and corner portion **24** of bracket **23**. A hexagonal nut **32** is mounted to the exterior end of screw **31**, and a washer member **33** is disposed between the nut and side **19**. Screw **31**, it will be seen, is mounted on an axis that extends transversely of both U-shaped passages. Therefore, as the screw is rotated abutment **27** will be caused to move along the screw, positioning the abutment either closer to or more distant from center portion **24**. Moving abutment **27** in the direction of center portion **24** will, of course, move flanges **29** and **30** against the ends of respective frame members **11**, thereby causing said members to be moved along the U-shaped passages in which they are confined. A movement of abutments at all four corners brackets **12** will obviously produce a framework of enlarged peripheral dimension.

FIG. 4 of the drawings schematically shows the preferred manner of expanding a framework comprised of frame members numbered **1**, **2**, **3** and **4**. The structural details of this framework are the same as previously described in connection with FIGS. 1–3. Beginning at one corner of the framework, such as corner bracket "*a*," the bracket is operated to move its abutment in a direction toward members **1** and **2**, causing them to occupy positions indicated by the broken lines **1***a* and **2***a*, respectively. Next corner bracket "*b*" is operated until its abutment produces an equal and opposite distortion of the frame such that members **3** and **4** assume the broken line positions of **3***b* and **4***b*. Brackets "*c*" and "*d*" are then operated in sequence to move members **2** and **4** into positions **2***c* and **4***c*, and frame members **1** and **3** into positions **1***d* and **3***d*. It is to be understood that the distortion of frame members shown in FIG. 4 is greatly exaggerated, and a tightening of any of the brackets does not require a reshaping of any of their U-shaped passages. Moreover, the best sequence of operation would entail multiple operation of each bracket in the sequential order described, thereby stretching material **13** at each of its corners in a progressive and increasing manner.

Although a preferred embodiment of this invention has been shown and described, it is to be understood that various changes may be made without departing from the spirit of the invention or the scope of the attached claims, and each of such changes is contemplated.

What I claim and desire to secure by Letters Patent is:

1. An expandable frame for stretching sheet material comprising: a plurality of frame members having generally rectangular cross sections held together in end-to-end relationship by corner guide brackets; each of said frame members being formed with a groove on one side and extending lengthwise thereof, the cross section of said groove having an interior dimension perpendicular to the length thereof and parallel to said sheet material in excess of the similar exterior dimension thereof, said excess lying entirely on the side of said groove nearest the inside of said frame; a locking strip in said groove, said locking strip having a cross section similar to the cross section of said grove; said corner guide brackets having a bottom and upstanding sides that define a pair of convergent U-shaped passages which receive the ends of two frame members, respectively, in slidable relationship; said frame member being oriented such that said groove is located on the topside of said frame; a movable abutment disposed at the intersection of each pair of said convergent U-shaped passages, said abutment having a pair of contact surfaces for simultaneously engaging the ends of said frame members; and means for independently moving each of said abutments in a direction transverse to the U-shaped passages of its corner bracket, thereby adjusting the position of said abutment and sliadbly moving said frame member along its associated U-shaped passage.

2. The expandable frame of claim **1** and sheet material stretched thereover, the edge portion thereof lying between said grove and said locking strip with one surface with one surface of said locking strip exposed.

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