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[54] **WOVEN SCREEN STRETCHING FRAME**
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[56]

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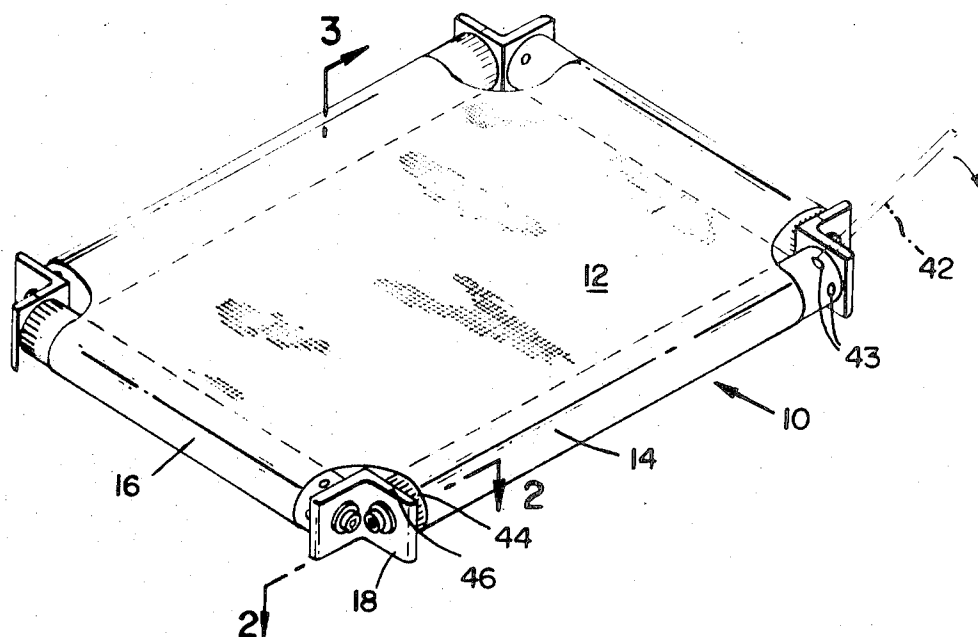
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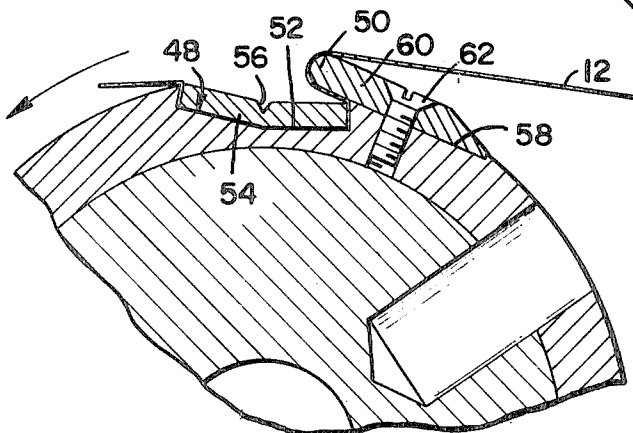
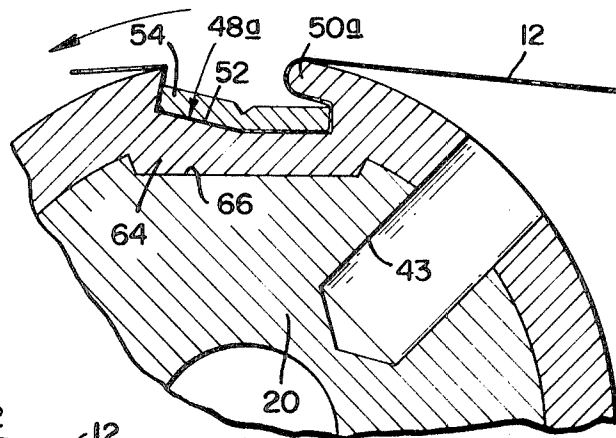
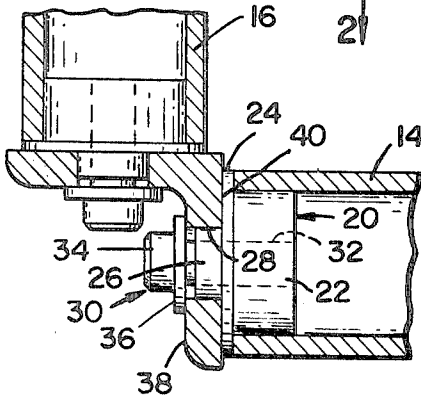
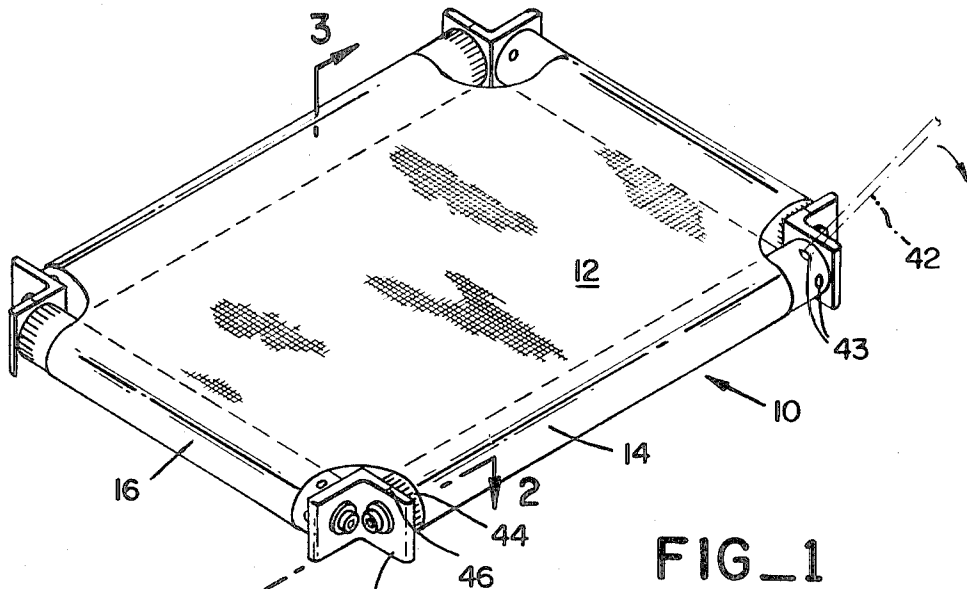
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ABSTRACT: A frame for supporting and stretching a rectangular printing screen of woven material comprised of pairs of opposite frame members connected by and journaled within corner members at their ends. The frame members have means for gripping the screen material along each edge and are rotatable within the corner members to apply tension to the screen in either dimension to create the desired amount of stretch in it.





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WOVEN SCREEN STRETCHING FRAME

This invention relates to improvements in woven screen printing apparatus and more particularly it relates to a frame for applying the desired amount of tension to a woven screen after it is mounted on the frame.

In screen printing processes commonly known as "silk-screening" a woven screen material is used and printing is accomplished by forcing ink through interstices of the screen provided by the weave or mesh of the screen. The image to be printed is permanently formed on the screen by blocking certain of the interstices using a photo etching process or the like. To achieve high quality results with good registration and resolution in "silk-screening" it is necessary for the screen to be maintained stable and under tension so that when the ink is being forced through it, the screen will not stretch. Heretofore, for high resolution and precise registration a stainless steel mesh was required because of its inherent resistance to stretching. However, such metal meshes were extremely expensive. Also, they lacked durability since the small wires forming the mesh were relatively fragile and tended to fracture, thereby requiring the replacement of the entire screen. Other screen materials such as nylon were found to provide a similar quality of results if the screen could be stretched to reduce the inherent resiliency of the material. Since nylon and other nonmetallic screen materials are much less expensive than stainless steel it became important in the printing industry to provide a mounting frame for a printing screen that can stretch a screen to any desired tension and retain it in that condition during its use. A general object of the present invention is to solve this problem.

Another object of the present invention is to provide a frame for mounting a sheet of mesh as woven material for use in a "silk-screening" process that will enable an unlimited amount of stretch to be applied to the sheet in either dimension. Thus, despite the characteristics of the sheet material used, most of its resiliency can be removed by initial tension and the tension can be maintained over a long period of use.

Another object is to provide a frame for "silk-screening" on which the exact amount of stretch can be measured, thereby enabling successive screens to be mounted thereon with exactly the same amount of tension.

Still another object of my invention is to provide a frame for mounting and applying tension to a printing screen that is particularly well adapted for ease and economy of manufacture and can be supplied with various interchangeable parts to form frames of different sizes.

In general my frame is comprised of opposite pairs of roller-like frame members journaled in connecting corner members so that the frame members can be turned by a spanner wrench or some such tool and then be locked in position. Each frame member has an axially extending means for gripping an edge portion of the screen, and increased tension on the sheet serves to increase the gripping force so no slippage can occur. Since each frame member is cylindrical in shape, it is inherently strong, and the entire frame structure can be light and easily handled.

Other objects, advantages and features of the present invention will become apparent from the following description presented with the accompanying drawings, in which:

FIG. 1 is a view in perspective of a frame embodying the principles of the present invention;

FIG. 2 is an enlarged fragmentary plan view in section taken along line 2—2 of FIG. 1 at one corner of the frame;

FIG. 3 is a further enlarged fragmentary view in section of one frame member of the frame device in FIG. 1; and

FIG. 4 is a view similar to FIG. 3 of a modified form of frame member for my frame device.

Referring to the drawing, FIG. 1 shows a frame 10 on which is mounted a printing screen 12 for use in making so-called "silk screen" type reproductions. The frame is comprised of a pair of side members 14 of equal length and end members 16

which may be shorter, all of which are similar in construction except for their length. Each frame member is generally cylindrical in shape and may thus be made from a metal tubing such as aluminum. At each corner of frame is a connector member 18 to which one side member and end member are rotatably connected. These connector members may be identical, each essentially comprising a right angle member with integral flange portions extending from a junction at 90° to each other. Fixed within each end of a frame member is a plug 20. Although various materials may be used for these plugs, I prefer to use a solid plastic having good bearing properties such as nylon. Each plug has a main body 22 which is press fitted into an end of the frame members. An adjacent flange portion 24 has a diameter equal to that of the frame member and provides a bearing surface between it and the connector member. A cylindrical boss portion 26 extends axially from the flange portion and fits with a smooth running clearance within a cylindrical hole 28 in the connector member.

From the outside surface of each flange on the connector members is a tightening screw 30 that extends through the hole 28 with its body 32 being threaded into the plug 20. The screw is provided with a head 34 having either a flat sided recess, as shown, or flat exterior sides to facilitate its turning by an appropriate wrench. A washer 36 is provided between the screw head and the outer surface 38 of the connector flange to increase the bearing area. Tightening of the screw 30 by a wrench on its head end draws the inner flange surface 40 of the connector against the flange portion 24 of the plug and thereby prevents any rotation of the frame member after it has been rotated to its desired position. When the screws are loose the frame members are rotated manually by means of a suitable torque bar indicated by the numeral 42 in FIG. 1. The latter may be attached substantially radially to the frame member as by inserting it in one of a plurality of spaced-apart radially extending holes 43 which are circumferentially spaced apart near one end of each frame member.

At the other end of each frame member I provide a series of circumferentially spaced-apart marks 44, and on the top edge of the adjacent connector flange or on the inner flange face 40 a single index mark 46 is provided which can be aligned with the marks 44 as the frame member is rotated. This enables the exact position of each frame member to be ascertained and thereby enables the amount of frame member rotation to be measured with precision so that a predetermined amount of stretch can be applied to a particular screen.

In order for the screen material 12 to be stretched properly it must be attached to the frame members 14 and 16 along its edge portions so that no slippage occurs even though the tension forces become substantial. A screen edge retaining means for each frame member essentially comprises an external groove 48 extending axially along its length and provided with an overhanging lip 50 along one side of the groove. In cross section the groove is slightly V-shaped with bottom surfaces 52 that slope inwardly and meet along a central low line. Within the groove 48 is an elongated retaining member 54 having approximately the same or a slightly narrower width as the groove and which is formed from some resiliently flexible material such as a suitable metal or plastic. Preferably, the retaining member has a notch 56 that extends axially along its top surface so that it will bend along a longitudinal axis to conform in cross section to the shape of the groove when it is inserted therein. When the screen is attached to a frame member, its edge portion extends across and around the overhanging lip portion 50, as shown in FIG. 3, and the frame member is rotated counterclockwise. The tension created on the screen causes the retaining member 52 to bind the edge portion of the screen more tightly in place against the overhanging lip. As tension increases in the mesh 12, force is exerted perpendicular to the edge of the retaining member 54, which is restrained by an equal and opposite force from the edge of the groove 48. These forces tend to further deform the member 54, forcing it against the V-shaped bottom of the

groove, with the mesh 12 between, thereby automatically increasing the grip on the mesh as tension is increased. Thus, the edge portions of the screen are secured and no slippage can occur as the frame members are rotated.

In FIG. 3 one embodiment of a frame member is shown which may be machined from common tubular metal stock. Adjacent the groove 48, a flat surface 58 can be formed to which is connected an elongated rule member 60 by means of a series of flat headed screws 62. The rule member extends beyond the edge of the groove and forms the lip 50.

In the embodiment of FIG. 4, a modified frame member is shown which is formed as an extrusion with an integral lip member 50a overhanging a groove 48a. A thickened portion 64 of the frame member extends longitudinally below the groove to strengthen the frame member at this point and this also provides a locking lug which cooperates with a slot 66 in the end plug 20 to help lock the plug in place and prevent any relative rotation with the frame member.

In use, the frame 10 may be used for mounting a printing screen made from any of a wide variety of materials. However, it is particularly valuable for use with materials such as nylon which must be stretched to a point necessary to minimize resiliency. Once the edge portions of the screen are attached to the four frame members, the wrench 42 may be applied in a hole 43 to rotate each member the exact amount required, the amount of stretch being measured by observing the number of calibration marks 44 passing the index line 46.

When the desired degree of screen tension is reached the locking screws in each corner connector can be easily taken up to hold the frame members firmly in place. It can be readily seen that the operation of my frame is relatively simple, yet highly efficient. If frames of different sizes are needed the same corner connectors can be used with pairs of frame members of different lengths. Thus, with one set of corner connectors and a stock of frame members, a printer can mount and use a wide range of screen sizes.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. A frame for supporting a printing screen comprising: a pair of end frame members and a pair of side frame members;

means in each said frame member for retaining an edge portion of said printing screen;

corner connector means rotatably supporting each of said frame members at their ends to form a closed rectangle;

and means for shifting said corner connector means along the axis of rotation of each of the adjacent frame members and for locking said frame members against rotation after they have been rotated to a predetermined position.

2. The frame as described in claim 1 wherein each said frame member is generally tubular and the means rotatably supporting each said frame member comprises a plug fixed within each end of each said frame member and journaled in said corner connector means.

3. The frame as described in claim 2 wherein said locking means comprises a machine screw extending through a portion of said corner connector means and axially into a said plug.

4. The frame as described in claim 2 wherein each said plug is made from a solid plastic material and has an integral end portion journaled in a said corner connector.

5. The frame as described in claim 1 wherein each said corner connector is a structural member comprised of a pair of side members integrally connected at right angles to each other.

6. The frame as described in claim 1 wherein said means in each said frame member for retaining an edge portion of said screen comprises an axially extending slot, means forming an overhanging lip along one axial side of said slot, and a flexible retainer strip in said slot for binding the screen material against said overhanging lip when tension is applied to the screen as the frame member is rotated.

7. The frame as described in claim 1 including a series of axially aligned indicating marks circumferentially spaced apart at one end of each said frame member, and an index mark on a said corner connector adjacent to said indicating marks on a connected frame member.

8. A frame as described in claim 1 further including a series of radially extending holes circumferentially spaced apart at one end of each frame for reception of a turning tool.

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