

[54] SCREEN TENSIONING APPARATUS

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448

[56] References Cited

UNITED STATES PATENTS

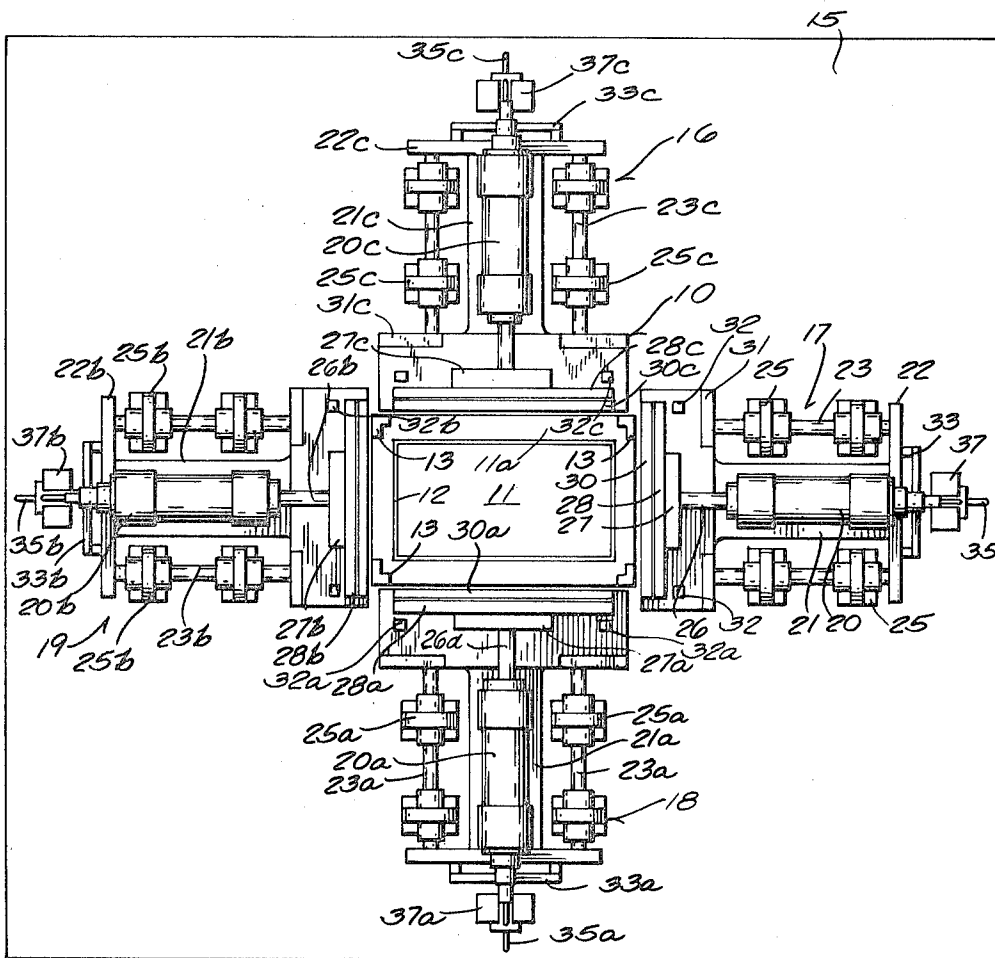
1,395,613	11/1921	Stickle	140/109
2,608,750	9/1952	Cluzel	140/109
2,898,951	8/1959	Watt	140/109
3,014,507	12/1961	Donkin	140/109
3,563,284	2/1971	Gordon	140/109

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Phillip Ryan

[57] ABSTRACT

An apparatus for applying a screening material in a frame structure wherein the tensioning of the screen as it is secured in the frame can be accurately determined and the screening material placed in the frame member in a consistent manner over long periods of operation. The screening device employs freely moving or "floating" clamp members which are placed under constant tension. The clamp members hold a screening material in four different directions and maintain the constant tension on the screen as it is forced into grooves in the frame member. The floating clamp members serve to maintain the desired tension at all times in that as the screening material is forced into channels in the frame by means of rods, the clamp members will move in the direction that the screen is being pulled while at all times maintaining the desired tension on the screen as it is press fitted into the channels. In a preferred manner, movable weights serve as the tensioning means and hydraulically operated piston rods are utilized as part of the floating clamp means which hold the screening material between bar and stationary wall members.

13 Claims, 5 Drawing Figures



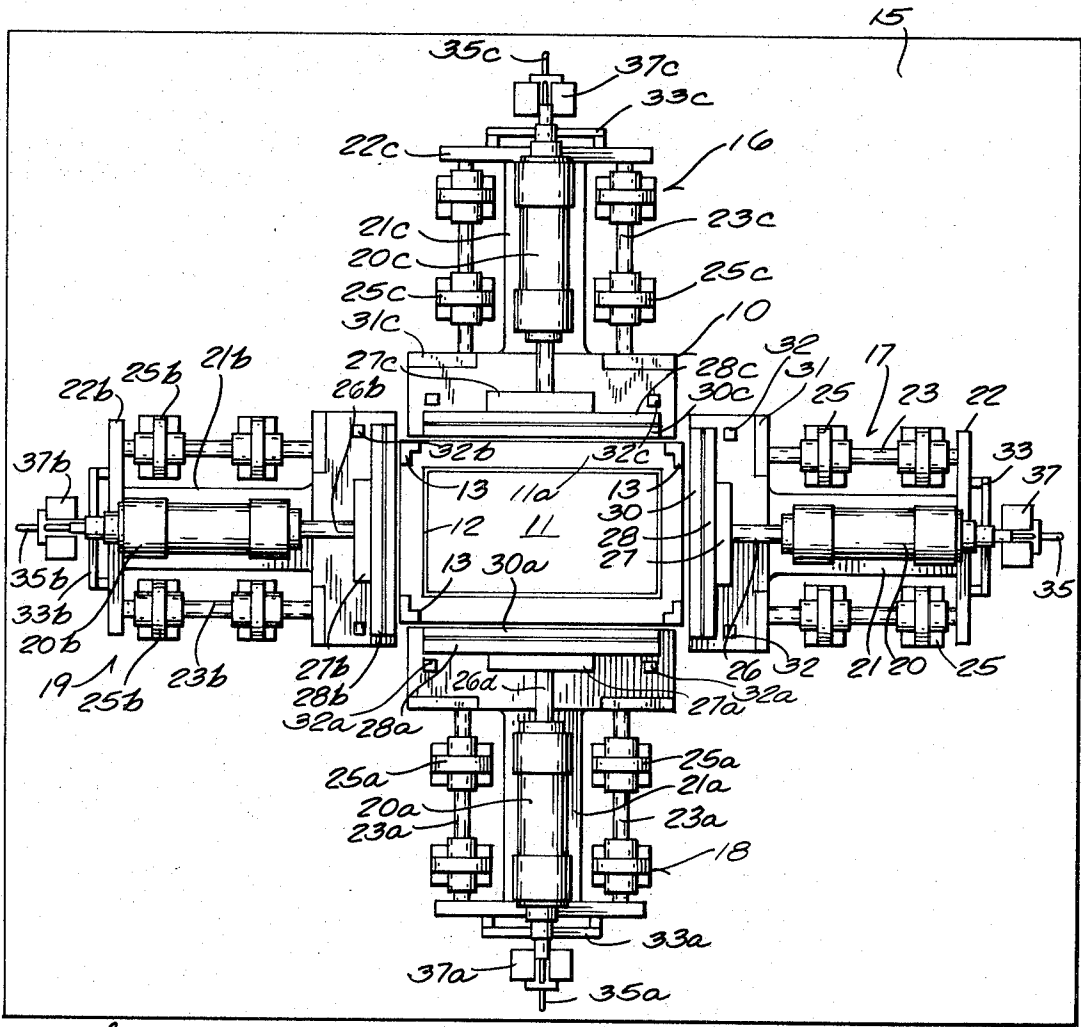


Fig. 1

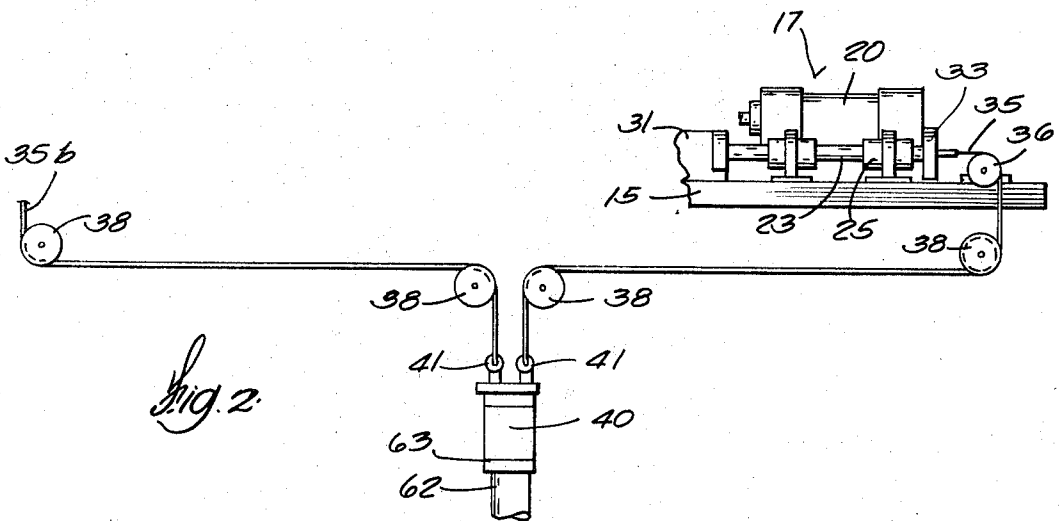
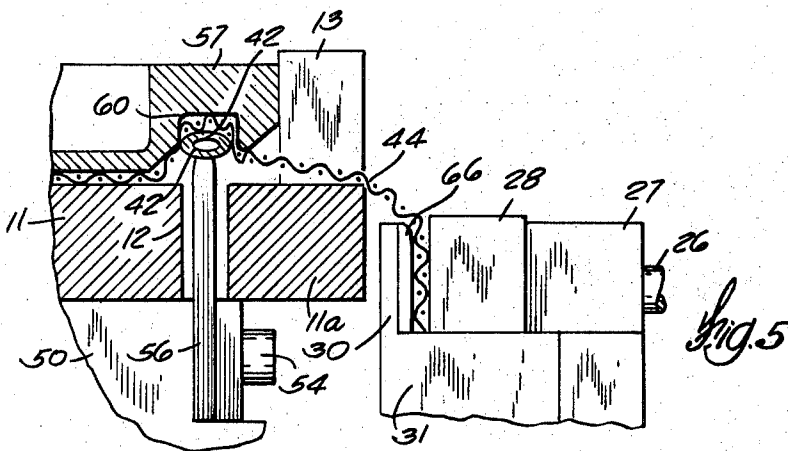
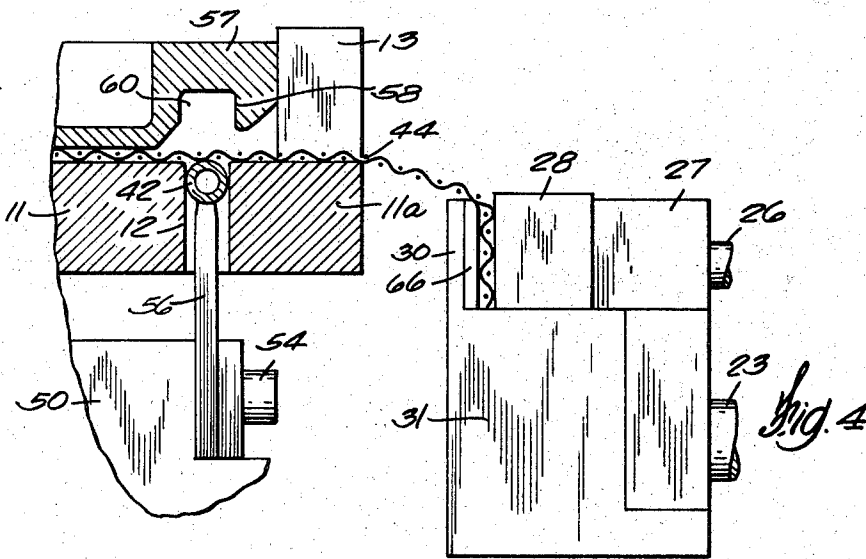
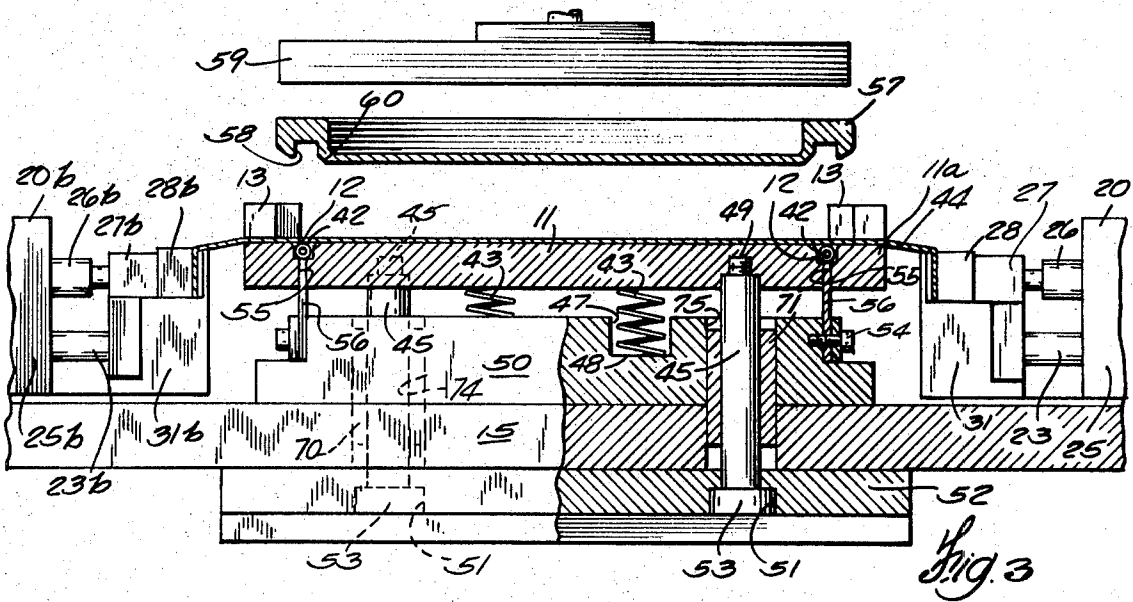


Fig. 2



SCREEN TENSIONING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for mounting a screening material in a tensioned manner in a frame member. More particularly, it relates to an apparatus having clamp members for holding the screening material as it is applied to a frame wherein the clamp members are tensioned in a manner so as to freely float with the screen while holding it under predetermined tension.

The placement of screening material in a frame presents problems in having the screen under proper tension at all times as it is secured to the frame member. This is particularly true when employing the technique of using tubular members to secure the screen in channels of the frame. It is common to employ a polyethylene rod which will press fit screening material in the "as cast" groove of a frame. As the rod is forced into the groove, the rod stretches and holds the screen mesh in the frame. As the grooves can vary in width and depth, variations in tension occur.

There is not currently available an apparatus which can accurately and at all times effect a predetermined tension on a screening material as it is positioned and secured in a frame member. Neither is there available a holding device for a screen which can positively hold the screen without manipulation and numerous procedures being employed by the operator of the machine. The prior art nowhere affords a mechanism which while positively and controllably holding screening material for placement in a frame affords adjustment for the tension in an easy manner.

It is an object of the present invention to provide a novel apparatus for securing screening material in a frame. It is another object of this invention to provide an apparatus which affords uniform and controllable tension of screening material as it is secured in the frame member. It is still another object of this invention to provide an apparatus which accurately controls the tension of screening material as it is secured in the frame wherein the holding and the tensioning is afforded in a positive manner and is easily adjusted. It is yet another object of this invention to afford an apparatus for securing screening in a frame wherein an operator need only perform a minimum number of steps and the apparatus is designed to compensate for any variance in the frame member or the rods which are used to secure the screening material in the frame.

SUMMARY OF THE INVENTION

The foregoing objects are accomplished and the shortcomings of the prior art are overcome by the present apparatus which includes a movable support base for a frame member and supporting and driving means for rod members to be secured in channels in the frame with screening material sandwiched between the rods and channel. The securing and driving means compose a support for the rods in one position and provides movement to another position so as to have the rods engage the walls of the channels in the frame. Movable clamping means hold screening material across the movable base containing the rods in channels and constant force tensioning means are provided for the clamps which permit movement of the clamps in opposing directions and in a floating like manner. This combined movement with tension holds the screening

material under constant and uniform tension as the screen material is forced into the channel. In a preferred manner, a driving member is oppositely positioned from the movable base and moves the frame onto the movable base member so as to force the rods into the channel in the frame with the screening material sandwiched therebetween. The tensioning means is afforded by having the clamp means slidably positioned on a support surface and the clamps attached to weighted cables which cables are supported over pulleys.

BRIEF DESCRIPTION OF DRAWINGS

A better understanding of the present apparatus will be afforded by reference to the drawing wherein:

FIG. 1 is a top plan view showing the apparatus of this invention.

FIG. 2 is a partial view of the apparatus shown in FIG. 1 illustrating the tensioning means for one of the clamp members.

FIG. 3 is an enlarged partial view of the apparatus shown in FIG. 1 with some of the components shown in vertical section and depicting the positioning of the screening material over the bottom movable base member with the frame member positioned between the base and an upper driving member.

FIG. 4 is a partial view similar to FIG. 3 illustrating the next step subsequent to that shown in FIG. 3 wherein the frame member engages the lower movable base member and the screening material is held in the movable clamping member.

FIG. 5 is a view similar to FIG. 4 illustrating the next and final step of securing the rod member with the screening material in the channel of the frame as the frame is pushed downwardly onto the movable base.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Proceeding to a detailed description of the present invention and particularly FIG. 1 the screen tensioning apparatus generally 10 is composed of a central movable base 11 with an outer frame portion 11a. The central and outer portions 11 and 11a provide a rectangular channel or groove 12. Four corner frame guides 13 are positioned at the corners of the movable base. Base 11 and outer portion 11a are supported on a vertical support 15 as are the clamp means composed of four clamp members 16, 17, 18 and 19. As all of the clamp members are the same only one of them will be described and the corresponding parts in the other members will be designated by the same numbers except with the "a, b and c" designation. A two-way hydraulic cylinder 20 is freely supported over support surface 15 by means of an underlying base 21 which is attached to crossmember 22. Two rods 23 are attached to crossmember 22 and extend through bushings 25 to freely support cylinder 20 over support surface 15 with bushings 25 being secured to support surface 15. Extending from cylinder 20 is a reciprocal piston rod 26 for moving a pushing block 27 against block 28 which in turn engages a stationary wall 30. Block member 28 rests upon the upper surface of platform 31 from which project restraining post members 32 for block 28. Platform 31 is attached to rods 23 as well as base 21. Consequently, platform 31 travels as a unit with base 21. A connecting bar 33 is disposed on the back side of crossmember 22 to provide attachment to a cable 35. This

is best seen in Fig. 2. A pulley 36 is disposed in housing 37 for cable 35 with housing 37 serving as a stop for piston rod 26. Cable 35 is guided over pulleys 38 and ultimately attached to a freely supported weight 40 by means of connection 41. Similarly, cable 35b which is secured to clamp member 19 is guided by pulleys 38 and attached to the same weight 40. Although not shown, clamp members 16 and 18 would have their cables 35a and 35c attached to a similar but separate weight. Both weights are positioned centrally, but apart, beneath movable base 11 and support 15. Hydraulic cylinders such as 62 have a piston 63 for lifting the weights to release the force on cables 35 and 35b.

Referring specifically to FIG. 3, the screening material such as a fine mesh stainless steel screen 44 is held over movable base portions 11 and 11a with hollow rods 42 having been placed in rectangular groove 12. Movable base portions 11 and 11a rest upon spring supports such as 43 with compression spring 43 resting against the under surface of base 11 and the shoulder section 48 of compartment 47. Guide rods 45 threadably engage base portions 11 and 11a by means of threads 49 and are guided by bushings 70 and 71 housed in compartments 74 and 75 formed in support 15 and plate 50, respectively. It will be seen that plate member 50 with compartments 47 and 75 is supported on support surface 15. Additional openings 51 are disposed in base plate member 52 for accommodating heads 53 of guide rods 45 in a movable manner.

Secured to plate member 50 by means of bolts 54 are punches 56 which extend through an accommodating channel 55 in movable base portions 11 and 11a for contacting hollow rods 42 in frame channel 12. It will be seen that channel 12 serves as a support for rods 42.

A metallic screen frame 57 has a rectangular groove 58 which is coincidental with rectangular groove 12 in movable base portions 11 and 11a. A driving member 59 is disposed above frame 57 for purposes as will be later explained in the Operation.

OPERATION

A better understanding of the advantages of the present screen tensioning device 10 will be had by a description of its operation. Four hollow rods 42 will be placed in rectangular groove 12 and will be of sufficient lengths so as to occupy substantially the entire length of the groove. Screening material 44 will then next be placed over movable bases 11 and 11a with sufficient screening extending in all four directions outwardly from the base and in the direction of clamp members 16, 17, 18 and 19. At this time cylinders 20, 20a, 20b and 20c will be actuated so that their piston rods 26, 26a-c will have been retracted from base portion 11 and 11a so as to move pushing blocks 27, 27a-c, respectively, away from block members 28 and 28a-c to permit manual movement of block members 28, 28a-c back against restraining post members 32, 32a-c, respectively. A portion of the screening will then be placed between stationary wall members 30, 30a-c with resilient but firm urethane facing 66, and block members 28 and 28a-c. Cylinders 20 and 20a-c will then be actuated so as to move push blocks 27 and 27a-c and consequently block members 28, 28a-c toward the wall members 30 and 30a-c so as to bind screening material 44 between stationary walls 30 and 30a-c and block members 28 and 28a-c.

A suitable screen frame 57 will then be positioned with rectangular groove 58 orientated with groove 12 in movable base portions 11 and 11a and positioned with its corners aligned over frame guides 13. The machine will then appear as shown in FIG. 3. In this position, driving member 59, which like clamps 16-19 can be actuated by a hydraulic cylinder (not shown) will move the driving member against frame 57 thereby pressing movable base portions 11 and 11a downwardly and consequently moving rods 12 upwardly toward groove 58 in frame 57. As driving member 59 moves downwardly, spring 43 will be compressed and base plate 52 with the heads 53 of guides 45 will move downwardly and away from support 15. The machine will then appear as shown in FIG. 4. Punches 56 are fixed in plate 50. Consequently, rods 42 will not move downwardly with base portions 11 and 11a but will be forced into grooves 58 of frame 57 and will be compressed and expanded in the groove and against walls 60 as shown in FIG. 5. Rods 42 thereby serve as securing members sandwiching screening 44 between rods 42 and channel 12, with driving member 59 and movable base portions 11 and 11a with channel 12 and punch 56 serving as supporting and driving means for rods 42.

Screen 44 is thereby fixed in a frictional manner in groove 58 and depending upon the amount of compaction of the rod desired, movement of the driving member is then discontinued in its downward movement and reversed so as to move upwardly, thereby causing base portions 11 and 11a to raise back to their normal position with screen material 44 fixed to grooves 58 by rods 42. To release the screening material from clamp members 16, 17, 18 and 19, respective piston rods 26 and 26a-c are moved inwardly toward the respective cylinders 20 and 20a-c so as to release the screening material 44 from between stationary wall members 30 and 30a-c, and block members 28, 28a-c.

An important aspect of this invention resides in the feature that throughout the previously described crimping of rods 42 in grooves 58, clamp members 16, 17, 18 and 19 are free to move toward base 11 or away from it as driving member 59 exerts a downward force on frame 57 causing a length of screening material to be taken up in grooves 58. This free movement is effected by movable bases 21, 21a-c for cylinders 20, 20a-c, platforms 31 and 31a-c for blocks 28, 28a-c and stationary wall members 30, 30a-c, disposed over support 15 by means of bushings 25 and rods 23. Each of the clamps 16, 17, 18, 19 and 20 is placed under tension and a force exerted on the screen 44 when it is clamped between stationary wall members 30, 30a-c and block members 28, 28a-c by means of cables 35, 35a-c which are ultimately secured to a freely hanging weight such as 40. This in effect creates a constant moving tension means on the screen 44 at all times and in all four directions, resulting in virtually any amount of tension within reason exerted on the screen 44 as it is secured in place in groove 58. This is an important feature when utilizing a crimping rod technique in that variations of groove sizes such as 58 will occur as well as variations in the size of the rods such as 42. All of these variances are eliminated by the constant and uniform tension which is at all times placed on the clamp members 16, 17, 18 and 19 by means of moving weights such as 40.

It should be pointed out that during the placement of screening 44 in movable clamp members 16, 17, 18 and 19 it is not desirable to have tension afforded by weights such as 40 on the clamps. Consequently, a piston 63 will be raised to contact and lift weight 40. After the screening 44 is suitably disposed in clamps 16, 17, 18 and 19, the piston is retracted and the weight 40 is allowed to be freely suspended.

In the preceding description, the usual conduits and control mechanisms associated with hydraulic cylinders 20, 20a-c have not been described as they are normal and include four-way valves which can be designed by anyone skilled in the art. The same is true regarding cylinder 62 and the driving cylinder for driving member 59 and its associated controls for moving driving member 59 downwardly toward base 11 and subsequently away from it. Obviously, pneumatic cylinders can be substituted for the hydraulic counterparts.

In the foregoing description, two clamping members connected to a single weight such as 40 has been indicated for the constant force tensioning means. If desired, a single weight could be provided for each clamping member to obtain uniform tension on all clamping members. Further, in place of a weight 40 a constant force type spring member could be substituted either at the position as indicated for weight 40 or attached to connecting bars 33 and 33a-c and fixed to a holding device which could be positioned at the same place as housings 37 and 37a-c. Any mesh size screening and any type of screening material or other resilient type materials such as cloth can be utilized as suitable adjustment for tension can be easily made. Further, hollow rods are the preferred securing members. However, solid rods composed of flexible materials such as aluminum or copper could be substituted.

While hydraulic cylinders such as 62 with pistons 63 have been indicated as a temporary weight relieving means for the clamps 16, 17, 18 and 19, these could be eliminated and the weights removed and replaced during the framing of the screen.

It will thus be seen that through the present invention there is now provided a screen mounting apparatus which while simple in its operation affords accurate and positive screen tensioning under various conditions. Variations in materials and parts of the frame and securing rods are offset by movable clamp members which are constantly under tension and afford uniform and controllable tension of the assembled screen from one assembly to another. The machine can be operated by an operator with a minimum amount of skills and the tensioning of the screen can be varied in an easy manner by means of varying the amount of weight or force tensioning.

The foregoing invention can now be practiced by those skilled in the art. Such skilled persons will know that the invention is not necessarily restricted to the particular embodiments herein. The scope of the invention is to be defined in terms of the following claims as given meaning by the preceding description.

We claim:

1. An apparatus for mounting a screening material in a frame member comprising supporting and driving means for at least one securing member, said supporting and driving means including means to support said securing member in one position and drive it to another

position relative to said frame so as to engage said frame member, freely movable clamp means operatively associated with said supporting and driving means to hold said screening material across said frame member and said securing member, and constant force tensioning means operatively associated with said clamp means to permit free movement of said clamp means in opposing directions and to hold said screening material under constant and uniform tension when said screening material is secured in said frame member.

2. The apparatus as defined in claim 1 wherein said securing member is a plastically deformable rod and said frame member includes a channel for engagement by said rod when forced therein by said driving means.

3. The apparatus as defined in claim 2 wherein said clamp means are comprised of a stationary wall member and a block member, a two-way hydraulic piston rod connected to said block member, said block member actuated by said piston rod for clamping said screening material between said stationary wall member and said block member.

4. The apparatus as defined in claim 2 wherein said channeled frame is four-sided and said clamp means comprise four individual means.

5. The apparatus as defined in claim 2 wherein said rod has a hollow core and said screening material is composed of stainless steel.

6. The apparatus as defined in claim 2 wherein said screening material is generally rectangular, said clamp means comprising first and second pairs of clamp plates arranged on opposite sides of said supporting and driving means for engaging said screening material.

7. The apparatus as defined in claim 2 wherein said clamp means includes relatively movable clamping surfaces and bidirectionally movable cylinder means for selectively clamping and releasing said screening material between said clamping surfaces.

8. The apparatus as defined in claim 7 including a support surface for said movable base and said clamp means, said clamp means being freely slidable on said support means, and guide means affixed to said support means for guiding the motion of said clamp means.

9. The apparatus as defined in claim 2 wherein said supporting and driving means for said rod includes a movable base member, a channel in said movable support, a fixed support communicating with said channel and a driving member oppositely disposed from said movable base member to contact said frame and force said rod into said channel in said frame with said screening material sandwiched therebetween.

10. The apparatus as defined in claim 9 wherein said movable base is supported by spring means and guide rods.

11. The apparatus as defined in claim 9 wherein said fixed support communicating with said channel comprises a stationary punch member.

12. The apparatus as defined in claim 9 further including a support surface for said movable base and said clamp means is slidably positioned upon said support surface.

13. The apparatus as defined in claim 12 wherein said tensioning means comprise weighted cables attached to said clamp means and supported over pulleys.

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