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JACK FRAMES AND STORAGE BIN CONSTRUCTION

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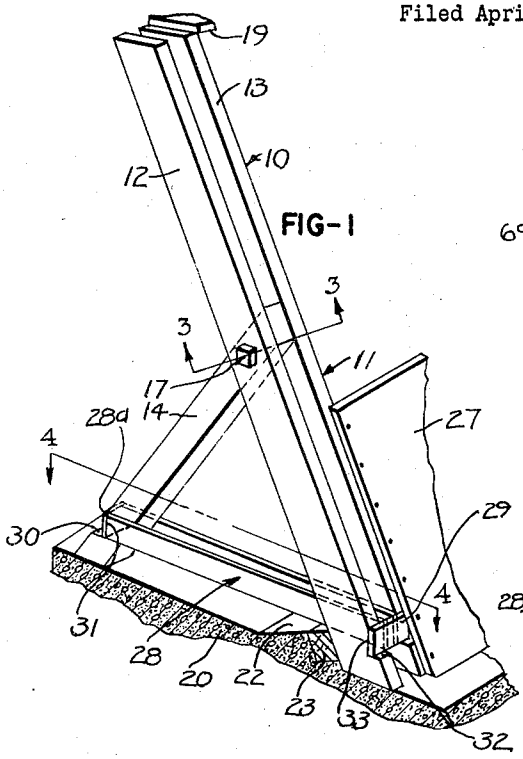


FIG-1

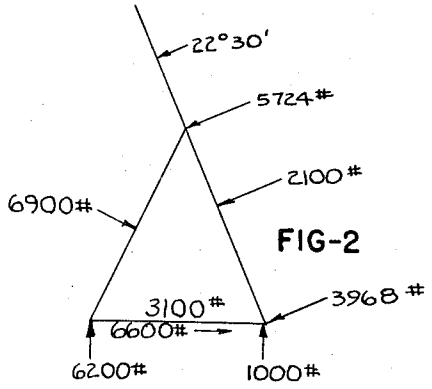


FIG-2

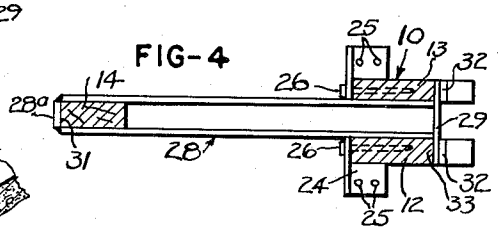


FIG-4

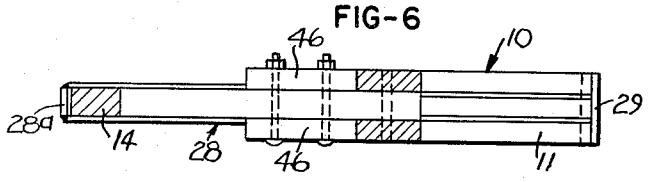


FIG-6

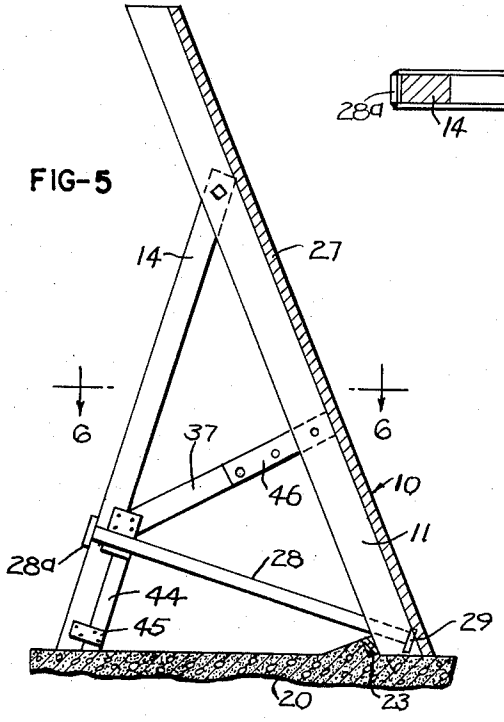


FIG-5

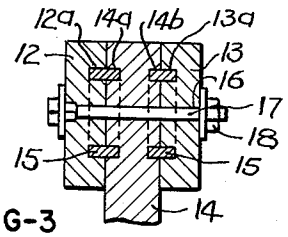


FIG-3

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JACK FRAMES AND STORAGE BIN CONSTRUCTION

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6 Claims. (Cl. 20—1.2)

Our present invention relates to storage bins and more particularly to improved jack frames and walls for a bin.

In recent years, because of the large quantity of bulk grain which requires storage for variable lengths of time prior to shipping, it has been found necessary to provide additional storage facilities therefor as well as for other free running materials. Due to the physical characteristics of bulk material of this type, it is not possible to store this material in many buildings because of their physical weakness to outward pressures and consequent strain on the walls.

Further, to build new grain elevators of conventional construction, it has been found that much expense is entailed and oftentimes the bulk material stored will be shipped within a few weeks and the structure then remains empty for another season. Therefore it is not practical to build expensive structures such as conventional elevators when their use may be only periodical.

It is therefore one object of this invention to provide means for constructing storage bins for bulk material which may be erected within a building forming an auxiliary wall capable of withstanding the strains exerted by a large quantity of bulk material, and which may with equal facility be built upon a concrete foundation poured for that purpose, or may even be constructed upon the surface of the ground where found advisable.

Another object of the invention lies in the provision of an improved jack frame adapted to support wall sheathing at a desired angle so that the stresses and strains created by the outward pressure of the bulk material are properly conveyed to the frame supports and abutment strips to adequately anchor the jack frames and contain the grain.

Another object of the invention lies in the provision of an improved jack frame which employs less material and labor to construct and therefore materially reduces the cost of constructing storage bins for bulk material.

Yet another object of the invention lies in the provision of novel means for anchoring the jack frames against horizontal outward movement.

These and other important objects of the invention will become apparent during the course of the following description wherein a preferred form of the invention accompanied by a limited number of modifications is shown. It should be understood, however, that the drawings are for the purpose of illustration only and are not intended to limit the scope of the invention, except insofar as it is expressly limited by the terms of the appended claims as required by the prior art.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts:

Figure 1 is a perspective view of an improved jack frame supported on a foundation and having a portion of wall sheathing secured thereto;

Figure 2 is a stress diagram for the jack frame shown in Figure 1;

Figure 3 is a cross sectional view as at line 3—3 of Figure 1;

Figure 4 is a horizontal cross section taken substantially at the plane of line 4—4 of Figure 1;

Figure 5 is a view partially in elevation and partially in cross section showing a modified jack frame; and

Figure 6 is a horizontal cross section taken on the plane indicated by line 6—6 of Figure 5 and having the sheathing omitted.

Referring now more particularly to the drawing, we have shown in Figure 1 a jack frame, indicated in general by the numeral 10, which has a front leg 11 extending upwardly at a rearward angle of 22 degrees 30 minutes from the vertical. It will be understood that the angle or inclination of the front leg may vary within limits, but it has been found that because of the stresses an angle as set forth is desirable. To a lesser extent, jack frames 10 having front legs disposed at any angle between from 17 degrees through 27 degrees from the vertical will function, and even greater variations will operate, but not to the greatest advantage since the farther the leg is removed from the desired 22° 30′ angle, the stronger the elements must be to support and counteract the stresses and strains applied by the bulk material contained in a bin employing the jack frames constituting the subject matter of this application.

As will be seen in Figure 1, the front leg 11 comprises a pair of parallel front leg members 12 and 13 which are spaced from each other a sufficient distance to receive the upper end portion of a bracing leg 14 therebetween. On their inner faces the leg members 12 and 13 are provided with an annular recess 12*a* and 13*a*, and the bracing leg 14 on its outer faces is provided with recesses 14*a* and 14*b*.

Inspection of Figure 3 will disclose that the annular recesses 12*a*, 13*a*, 14*a*, and 14*b* are coaxial and communicate in pairs with each other. In the recesses, we provide cylindrical preferably metal sleeves 15, which pivotally unite the bracing leg 14 and the front leg 11 so that the bracing leg 14 may be pivoted to a position where it extends axially parallel with and between the front leg members 12 and 13 for storage and transportation purposes.

Coaxial with the recesses, we provide a bore 16 which extends through the front leg 11 and the cooperating portion of the bracing leg 14. A clamping bolt 17 extends through the bore and is releasably secured by means of a conventional nut 18. It will thus be seen that a relatively small bolt, for instance, a ¾ inch bolt, may be employed to unite the front leg 11 and the bracing leg 14. However, the cylindrical sleeves 15, which in actual practice are 4 inches in outside diameter, provide a large bearing surface for transmitting the stresses from the front leg 11 to the bracing leg 14, still providing a pivotal connection between the legs. It is to be noted that the lower end of the rear or bracing leg 14 terminates rearwardly spaced from the rearward extension of the front leg 11.

In actual practice, in the species shown in Figure 1, the front leg members are each formed of 2″ x 10″ timbers, while the bracing leg member is formed from a 3″ x 6″ timber. It will thus be seen that the structure is heavy for supporting large weights and stresses.

At its upper and lower ends, the front leg 11 is provided with horizontal end faces, the upper ones of which are adapted to receive a cap plate 19 to protect the ends of the legs against weather, and the lower ends of which are adapted to be supported upon a horizontal supporting surface which may be the concrete foundation 20 shown to extend longitudinally of the completed wall under the jack frames 10. The foundation 20 is provided with a ramp 22 having imbedded therein disposed at an angle

commensurate to the angle of the front legs 11 a longitudinally extending abutment strip 23.

A heel plate 24, which is here shown to be a metal plate extending horizontally in back of the front leg 11 at its lower end, is provided with multiple apertures such as 25 to receive nails 26 or other fastening devices by means of which the heel plate 24 is secured to the back side of the leg 11. As seen in Figure 2, the plate extends laterally beyond the marginal edges of the front leg 11 and selected ones of the apertures 25 are provided to receive nails or other fastening means for securing the front leg to the abutment strip 23.

Sheathing 27 is applied to the front edges of the front legs 11, thus forming an angular wall for the bin.

Obviously, pressure applied to the front legs 11 by means of bulk material dumped into the bin will cause the lower end of the bracing leg 14 to spread from the lower end of the front leg 11, and therefore we provide means for anchoring the lower ends of these legs together.

This means comprises a yoke 28 which straddles the lower end of the bracing leg 14 and extends forwardly or inwardly between the lower ends of the front leg 11, and is provided with a crosshead 29 which extends over or overlays the front edges of the leg 11. To prevent movement of the yoke 28, the rear leg 14 is provided with a notch 30 having a vertical wall 31, and the front leg members 12 and 13 are provided with notches 32 having vertical walls 33. In actual practice, nails are driven into the legs to prevent accidental displacement of the yoke 28.

The length of the front leg 11 will vary in different applications of the invention. However, for purposes of illustration, the jack frame 10 disclosed in Figure 1 has a front leg which is substantially 12 feet in length, and a base spread between the forward lower end of the front leg 11 and the rearward lower end of the bracing leg 14 of substantially 6 feet. The yoke is constructed of preferably 14 gauge 1¼" strap having a plate 28*a* of ¼" material welded to the rear ends thereof, and a crosshead 29 formed of a plate 7/16 of an inch in thickness.

Inspection of Figure 2 will disclose the stresses present in a jack of this type wherein 5,724 pounds of pressure are applied at the pivotal connection between the front leg 11 and the bracing leg 14, while 3,968 pounds are applied at the toe of the front leg 11 when the legs are erected along a wall on 2 foot centers. This creates a tension stress along the length of the front leg 11 of 2,100 pounds and a compression stress along the length of the bracing leg 14 of 6,900 pounds. Under these conditions, the tension stress in the yoke 28 is 3,100 pounds while the abutment strip 23 must support 6,600 pounds horizontal outward pressure. The supporting pressure or the downward pressure on the foundation 20 at the lower end of the bracing leg 14 is 6,200 pounds, while at the lower end of the front leg 11 it is 1,000 pounds. It is obvious that under such conditions of great stress and pressures, the jack frames must be properly constructed to provide an acceptable storage bin at minimum expense of time and money.

In actual practice, the axis of the clamping bolt 17 is disposed 6'6" from the lower end of the forward leg on its center line in a jack frame of the size disclosed.

Referring now to Figure 5, it will be seen that we have employed both the yoke 28 and bracing, as at 37, intermediate the front leg 11 and the bracing leg 14, while the pivot point of the leg 14 is located further upwardly along the leg 11, and at its lower end the bracing leg 14 is provided with a supplemental portion 44 which enlarges the lower end of the bracing leg 14. A metal band 45 precludes splitting of the leg 14. The brace 37 is provided with blocks 46 on its side faces, and these bear against the rear face of the front legs 11 to receive and transmit the pressures from the front leg to the brace 37 and thence to the bracing leg 14.

Having thus described our invention, we claim as new and desire to secure by Letters Patent of the United States the following:

1. In a storage bin wall, a jack frame having a front leg extending upwardly at a rearward angle; said leg comprising a pair of parallel leg members spaced from each other; a bracing leg having its upper end disposed intermediate said front leg members and secured thereto and extending downwardly at a rearward incline and terminating rearwardly of the upper end of said front leg; a yoke secured to said bracing leg at its lower end and extending forwardly intermediate said spaced leg members; and a crosshead carried by said yoke and disposed in front of said front leg members at their lower ends, whereby to preclude spreading movement of the lower ends of said front leg and said bracing leg.

2. In a storage bin wall, a jack frame having a front leg extending upwardly at a rearward angle; said front leg comprising a pair of parallel spaced leg members; a bracing leg having its upper end disposed intermediate said leg members; said leg members on their inner faces and said bracing leg on its side faces having coaxial annular recesses; rigid cylindrical sleeve disposed in cooperating ones of said recesses pivotally uniting said bracing leg with said front leg for movement in a plane common to said legs; said front leg and bracing leg having a bore concentric with said annular recesses and extending therethrough; a clamping bolt in said bore and adapted to clamp said legs together; and means rigidly securing said bracing leg to said front leg against relative spreading movement of the lower ends thereof.

3. In a storage bin wall, a jack frame having a front leg extending upwardly at a rearward angle; said front leg comprising a pair of parallel spaced leg members; a bracing leg having its upper end disposed intermediate said leg members; said leg members on their inner faces and said bracing leg on its side faces having coaxial annular recesses; rigid cylindrical sleeves disposed in cooperating ones of said recesses pivotally uniting said bracing leg with said front leg for movement in a plane common to said legs; said front leg and bracing leg having a bore concentric with said annular recesses and extending therethrough; a clamping bolt in said bore adapted to clamp said legs together; and a yoke having a crosshead disposed on the front side of said front leg at its lower end and straddling said bracing leg at its lower end, to preclude relative spreading movement of the lower ends of said legs.

4. The invention as defined in claim 3, wherein the front side of the front leg members at their lower ends and the back side of the bracing leg member at its lower end are provided with notches having vertical walls against which said crosshead and yoke bear; and means releasably securing the yoke and crosshead against movement out of said notches.

5. In a storage bin wall, an abutment strip fixed upon a wall support surface, a jack frame having a front leg extending upwardly at a rearward angle; said front leg comprising a pair of parellel spaced leg members; a bracing leg having its upper end disposed intermediate said leg members; said leg members on their inner faces and said bracing leg on its side faces having coaxial annular recesses; rigid sleeves disposed in cooperating ones of said recesses pivotally uniting said bracing leg with said front leg for movement in a plane common to said legs; said front leg and bracing leg having a bore concentric with said annular recesses and extending therethrough; a clamping bolt in said bore adapted to clamp said legs together; a yoke having a crosshead disposed on the front side of said front leg at its lower end and extending rearwardly and straddling the bracing leg at its lower end, to preclude relative spreading movement of the lower ends of said legs; and a heel plate secured to the back side of the front leg at its lower end and extending

laterally beyond the marginal edges thereof and having apertures adapted to receive fastening elements for securing the front leg to said abutment strip.

6. In a storage bin wall having an upright jack frame; said jack frame having front and rear legs; sheathing secured on the front legs on their inner faces, means for securing said jack frame against outward horizontal movement comprising; a concrete foundation strip extending longitudinally of the wall and supporting said jack frame; an elevated integral ramp formed on said foundation and extending longitudinally of the wall; an abutment embedded in said ramp for transmitting horizontal pressures thereon as compression pressures directly to said ramp; and means secured to the front leg of said jack frame and secured to said abutment strip for supporting said jack frames against said outward horizontal movement.

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