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2,896,994

CLAMPING DEVICE FOR INDUSTRIAL TRUCKS

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FIG. 4

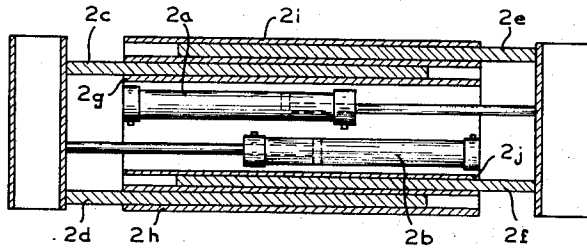


FIG. 1

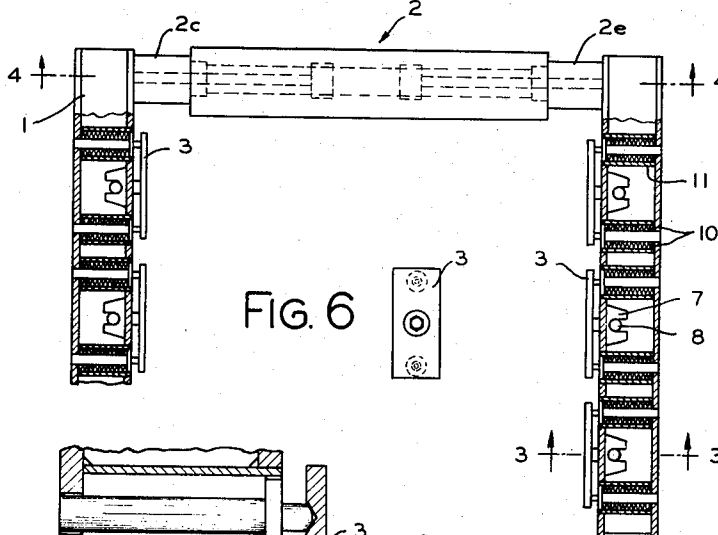


FIG. 6



FIG. 2

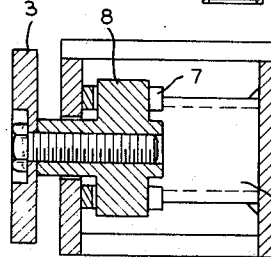
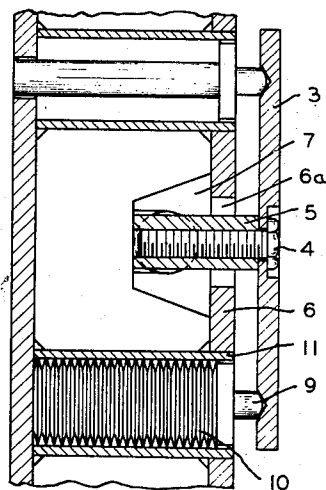


FIG. 3

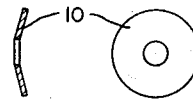


FIG. 5

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ATTYS.

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CLAMPING DEVICE FOR INDUSTRIAL TRUCKS

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8 Claims. (Cl. 294—63)

This application relates to attachments for industrial lift trucks and the like, and more particularly, to clamp attachments or devices which are used with such machines for the palletless handling of certain classes of goods.

While industrial lift trucks are most frequently equipped with fork tines projecting from the front for engaging pallets and thereby lifting, transporting, and elevating loads supported on the pallets, it is well known to use clamp devices on such machines. Such devices engage the sides of a load with sufficient pressure to enable the machine to pick up the load without the use of a fork and without a pallet. One common application for clamp attachments or devices of this type is in the handling of bricks, concrete blocks and the like where it is common practice to tier several layers of bricks or blocks and then pick up the entire stack by clamping the bottom layer.

In the handling of bricks or blocks in this manner it is necessary to provide some means on the clamp arms for accommodating variations in thickness of the bricks or blocks.

One previously known means for accomplishing this is to employ clamp arms equipped with hydraulically operated clamp pads, with each clamp pad being operated by its individual small hydraulic motor in the form of a cylinder and piston. However, such a construction is complicated and expensive. Moreover, there is considerable danger that the small hydraulic cylinders may develop leaks on account of the rough usage to which they are subjected when loading bricks. The large amount of abrasive brick dust which is present in connection with such an operation enhances this possibility. Such clamp arms with hydraulically operated clamp pads commonly have the hydraulic motors connected directly to the general hydraulic system of the lift truck or stacker, consequently a loss of oil from only a few of the cylinders may interfere seriously with the operation of the lift truck and may go so far as to jeopardize the entire hydraulic system.

Another previously known type of clamp device for handling bricks and the like employs mechanically operated clamp units which are equipped with rubber rollers in order to afford a better grip. Such devices must have several sets of jaws because the clamp units can hold only one brick each. Moreover the rubber rollers wear very rapidly and must be continually replaced.

The object of this invention is to provide a simple, low-cost clamp attachment which avoids the disadvantages of previous devices of this type.

In carrying out my invention in one preferred form thereof, I provide a clamp device which is equipped with only a few mechanically operated clamp pads. These pads are mounted in a manner such that they are yield-

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able and at the same time can make a slight rocking motion. Springs are provided to maintain them in an extended and rockably intermediate position when not in use. These clamp pads are mounted on the clamp arms in pairs with each pair being disposed on opposing clamp arms in confronting relation. If there are variations in the dimensions of the bottom row of bricks or blocks which is clamped between the clamp pads, then the spring biased clamp pads adjust themselves slightly so that the pads exert substantially uniform pressure on the surfaces of the end bricks in each row.

For a clearer and more complete understanding of my invention, reference should be had to the accompanying drawing in which:

Figure 1 is a top plan view of a clamp device embodying the invention, with portions of the device cut away, this device being provided with two clamp jaws each of which is equipped with three clamp pads,

Figure 2 is an enlarged view of a portion of the left clamp arm in Figure 1 including one of the clamp pads,

Figure 3 is a sectional view along the line 3—3 in Figure 1,

Figure 4 is a sectional view along the line 4—4 in Figure 1,

Figure 5 illustrates a front elevation view and a sectional view of a spring disc element, and

Figure 6 is a front elevation of one of the clamp pads.

The device shown in Figure 1 of the drawing is arranged to lift a stack of bricks with a basis or foundation of three rows of brick. The confronting clamp pads on opposite arms act in pairs. In the device illustrated there are three such pairs of clamp pads; therefore, three rows of bricks can be clamped simultaneously, it being understood that other bricks are normally stacked on top of the three bottom rows. It will be understood that the clamp arms may be made longer in order to accommodate additional pairs of clamp units if desired.

The clamp device illustrated in Figure 1 of the drawing comprises a pair of clamp arms 1 which in the form shown are rectangular in cross section and are fabricated from metal plates which have been welded to form a unitary structure. The clamp arms are arranged to be operated toward and away from each other by hydraulic motor means 2 or other equivalent means. The entire clamp device ordinarily is attached to the front of an industrial lift truck, stacker, or the like.

Hydraulic motor means 2 (Figure 4) comprises a pair of vertically spaced piston and cylinder assemblies 2a and 2b, each of which is fixedly connected at its cylinder base end to framework as shown and at its piston rod end to one of the clamp arms 1. One of the clamp arms is guided and supported during rectilinear movement thereof by rectangular guide bars 2c and 2d, and the other clamp arm is similarly guided and supported during such movement by rectangular guide bars 2e and 2f, said guide bars being mounted to slide in vertically spaced and open ended cooperating guide means 2g, 2h, 2i, 2j, respectively.

Each of the clamp arms is equipped with three clamp pads 3, and these pads are arranged in pairs on the opposing clamp arms. As may be seen best in Figures 2 and 3, each clamp pad 3 is mounted on a guide member 5 by means of a screw 4, the guide passing through an opening 6a in the jaw member 1. Each guide member 5 is provided with a pair of trunnion portions 8 as may be seen in Figure 3. These trunnion portions pivot in a trunnion mounting means which comprises a pair

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of bracket members 7 which are secured within the clamp arm. Each of the brackets 7 has a U-shaped recess therein to receive one of the trunnion portions 8. The recess provides a lost motion connection between the bracket and the trunnion portion.

The clamp pads are biased outwardly away from the structure of the clamp arms towards their fully extended positions by pairs of springs 10 which preferably are made up of a plurality of oppositely facing annular spring discs (Figure 5) installed in guide cylinders 11. I have found this type of spring to be most desirable for this purpose; however, other types of springs may be used without departing from my invention. The springs act on the clamp pad through pins 9 which are seated in suitable depressions in the back of the clamp pads. When the clamp arms are operated to clamp a row of bricks between an opposing pair of clamp pads on the opposite arms, this construction provides equalization of pressures resulting from unevenness in the bricks. The clamp pads rock slightly to accommodate such unevenness and permit the clamp pads to make full contact with the brick surfaces at both ends of the row. It will be understood that a clamp pad pivots about a vertical axis on the trunnions 8. One end of the pad will be pressed inwardly toward the clamp arm a greater amount than the other end depending upon where the thickness of the row of bricks is the greatest, although it should be understood that the entire clamp pad assembly is yieldable, and each pad is pressed toward its clamp arm a small amount when a load is picked up as the respective trunnion portion 8 is moved inwardly of the corresponding recess in bracket 7. The spring units can be made more or less resilient thereby changing the amount the clamp pads yield, depending upon the bricks or other material being handled, and can be replaced easily.

Clamp devices of this construction have been operated without difficulty and without noticeable wear even in cases of very rough handling. They are gentle on loads of bricks, particularly unburnt bricks or so-called green bricks, which require careful handling. Previously known clamp devices were not suitable for such bricks. This construction allows a selection of very exact gripping pressure by the selection of annular disc springs of suitable resilience.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a clamping device, a pair of straight hollow jaw members positioned in spaced apart parallel relation, means for operating said jaw members toward and away from each other, a plurality of pairs of flat longitudinally extending clamp pads mounted on the said jaw members, the different ones of each pair of pads being located respectively on opposite jaw members in confronting relation, a guide member rigidly connected centrally on the back of each pad and extending through an opening in a jaw member, a pair of trunnion portions on each said guide member within the jaw member, a pair of brackets for each guide member connected to the jaw member, the said brackets having recesses therein arranged to receive the said trunnion portions for providing seats for the trunnion portions when the clamp pads are at rest and guides for the trunnion portions when the pads move, a pair of annular disc springs for each pad located adjacent the ends thereof and within the adjacent jaw member, pin means between each said spring and the adjacent end of a pad for transmitting the force of the spring to the pad, and the said springs and trunnion members and brackets being arranged so that each pad is yieldable when material is being clamped between a pair of pads and is rockable about a rectilinearly movable vertical axis.

2. A clamping device for use on an industrial lift truck or the like, comprising support means, a pair of jaw members mounted on said support means for move-

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ment toward each other in a rectilinear path, trunnion mounting means connected to each said jaw member, and at least one pressure equalizing device located on each said jaw member, said pressure equalizing devices being arranged in confronting relation and adapted to clamp material therebetween and each comprising a clamp pad, spring means biasing the clamp pad towards a fully extended position and trunnion means mounting the clamp pad on one of said trunnion mounting means, said latter means and mounting means being constructed to permit the clamp pad to pivot relative to the jaw member out of said extended position and to move relative to the jaw member in a rectilinear path.

3. In a clamping device, support means, a pair of jaw members mounted on said support means for movement toward each other, a trunnion mounting means connected to each jaw member, and a pair of pressure equalizing devices located in confronting relation on opposite ones of said pair of jaw members and adapted to clamp material therebetween, each pressure equalizing device comprising a clamp pad, spring means biasing the clamp pad towards a fully extended position and trunnion means mounting the clamp pad on one of said trunnion mounting means, said latter means and mounting means providing a lost motion connection such that the clamp pad is both pivotable relative to the jaw member out of said extended position and is also movable relative to the jaw member in a rectilinear path.

4. A clamping device as claimed in claim 3, wherein said jaw members are movable toward each other in a rectilinear path, and said trunnion and trunnion mounting means permits simultaneous rectilinear pivotal movement of said clamp pads.

5. A clamping device as claimed in claim 4 wherein said jaw members are hollow, each trunnion mounting means comprises bracket means which is mounted within and connected to the respective hollow jaw member, and said bracket means includes a lost motion recess therein for receiving the respective trunnion means.

6. A clamping device as claimed in claim 5 wherein said spring means comprises a pair of springs operatively connected to each clamp pad and located respectively adjacent opposite ends thereof, said springs, bracket means and trunnion means being arranged so that each clamp pad is yieldable when material is clamped between said pads and is rockable about a rectilinearly movable vertical axis.

7. A clamping device for use on an industrial lift truck or the like, comprising support means, a pair of jaw members mounted on said support means for movement toward each other, lost motion bracket means connected to each jaw member, and at least one pressure equalizing device located on each said jaw member, said pressure equalizing devices being arranged in confronting relation and adapted to clamp material therebetween and each comprising a clamp pad, a pair of springs located respectively adjacent opposite ends of the pad and biasing the pad to a fully extended position and trunnion means mounting the clamp pad on a said bracket means intermediate said pair of springs such that the clamp pad is pivotable relative to the jaw member against the bias of said pair of springs and is also movable relative to the jaw member in a rectilinear path simultaneously with pivoting movement thereof.

8. In a clamping device, support means, a pair of clamping members mounted on said support means, at least one of which members is movable towards the other to clamp material therebetween, trunnion mounting means connected to at least one of said members, and a pressure equalizing device located on said one member in confronting relation to the other such member, said equalizing device comprising a clamp pad, spring means biasing the clamp pad towards a fully extended position and trunnion means mounting the clamp pad on

said trunnion mounting means, said trunnion means and trunnion mounting means being constructed to permit the clamp pad to pivot relative to said one member out of said extended position and to move relative to said one member in a rectilinear path.

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