(54) Title: DEVICE AND SYSTEM FOR LIFTING OFFICE FURNITURE

(57) Abstract

A system (10) for lifting office furniture such as partitions, panels, desks and filing cabinets. The system includes a base (12) which rests upon a floor, a lifting body (18) movably attached to the base (12) and adapted to raise and lower in a generally vertical direction, and a plurality of preferably removable and interchangeable furniture engagement elements (22) for engaging different types of furniture during lifting.
DEVICE AND SYSTEM FOR LIFTING OFFICE FURNITURE

BACKGROUND OF THE INVENTION

The present invention relates generally to a device for lifting furniture. Specifically, the invention relates to a device for temporarily lifting office furniture, for example, while a floor covering or cabling is being installed or replaced underneath.

Many office environments are now created by starting with a large space and then subdividing it to create individual work stations with office panels, storage units, work surfaces and the like. Many of these components are equipped to distribute power and data cabling through the work stations. For example, many office panels include a raceway at the base through which electrical power is distributed, either by conventional wiring, or by modular power systems. Also, many panels include raceways or channels in which data cabling, e.g. computer or voice networks, are laid.

In addition to supporting the cabling requirements in the office space, some office panels are also used to support work surfaces and storage units. In particular, some work surfaces and storage units hang from the sides of office panels and are attached thereto by hooks inserted in the slotted rails or “slotted standards” positioned vertically at the ends of each panel. This support system is commonly referred to as a cantilever system.

While it is a goal of most office panel systems to maintain some degree of flexibility for reconfiguration, the presence of the power and data cables, together with the cantilever supported components, can make the task of moving these work stations difficult.

Another trend in office environments has been to use carpet tile as the floor covering. One reason for the popularity of carpet tile is that worn or stained carpet tiles can be replaced one at a time instead of replacing an entire section of broadloom carpet. Even if an entire room full of carpet must
be replaced, carpet tile can be much less disruptive to install, particularly in
an office environment.

Naturally, if carpet tile is being installed or replaced in a work
environment that is equipped with an office panel system, the office panels
need to be lifted in order to remove the old carpet and to install the new
carpet tiles. Known devices for lifting furniture while carpet tile is installed,
such as that disclosed in U. S. Patent No. 5,234,197 ("the '197 patent"),
5 5,459,897 ("the '897 patent") and U. S. Patent No. 5,490,757 ("the '757
patent"), utilize a rocker and lever type design. There are problems
associated with this design. For example, in the '197 patent, the device
comprises an arcuate foot, one end of which is adapted to fit under an object
to be lifted, and a central shaft secured to the foot at a predetermined angle.
10 To operate the device, an operator pulls back on the shaft to one of several
predetermined angles with respect to the foot. Thus, the height to which the
object can be lifted is limited. The device disclosed in the '897 patent
requires the operator to continuously apply pressure to the device to keep
the furniture lifted, making it difficult for the operator to simultaneously install
carpet tiles underneath.

SUMMARY OF THE INVENTION

The present invention provides a system for lifting office
furniture such as panels and all attached furniture systems as well as
freestanding furniture, while floor covering or cabling is installed or replaced
underneath. The system includes various furniture engagement elements of
differing configurations for holding a piece of furniture during lifting.

In one aspect of the invention, a jack for temporarily lifting
pieces of office furniture includes a base and a lifting body movably attached
to the base and adapted to be raised and lowered in a generally vertical
direction. The lifting body is adapted to engage a piece of office furniture and
thereby lift it when raised. In this aspect, one of the base or the lifting body includes a vertical screw attached thereto, and the other of the base or the lifting body includes a threaded opening attached thereto. As a result, the lifting body and thus the piece of office furniture is raised and lowered by relative rotation between the vertical screw and the threaded opening.

In another aspect of the invention, the system includes a base which rests upon a floor and a lifting body movably attached to the base. Preferably, the lifting body is adapted to raise and lower in a generally vertical direction and includes an engagement face defining at least one slot. The system also includes a plurality of furniture engagement elements, each with an engagement end adapted to engage and hold a piece of office furniture during lifting. Preferably, each engagement element is adapted to be removably and interchangeably attached to the engagement face of the lifting body through the slot.

In yet another aspect of the present invention, the device for temporarily lifting at least two office panels having slotted standards includes a base which rests upon a floor and a lifting body movably attached to the base and adapted to raise and lower in a generally vertical direction. The device also includes a furniture engagement element comprising a first and second hook each attached to the lifting body and spaced horizontally whereby the first hook can be inserted into the slotted standard of a first office panel and the second hook can be inserted into the slotted standard of a second and adjacent office panel. Preferably, the first and second hooks are able to be moved both horizontally and vertically with respect to each other to thereby account for different horizontal distances and/or vertical offset between slotted standards of adjacent panels.

In accordance with still yet another aspect, the device for temporarily lifting an office panel having a slotted standard includes base and a lifting body movably attached to the base and adapted to raise and lower in
a generally vertical direction. A furniture engagement element is attached to the lifting body and includes a hook which is inserted into a first slot of the slotted standard. The device further includes an engagement wedge which is inserted into a second slot of the slotted standard, which second slot is immediately above the first slot. As a result, the slotted standard is reinforced during lifting of the first hook.

The present invention allows a user to lift office systems furniture in a substantially vertical manner, thereby preventing damage to joined office panels. Another advantage of the aspect which utilizes a vertical screw for the lifting mechanism is that it maintains furniture in a raised position without continuous pressure from the user. This allows the user to have both hands free to install floor covering or cabling underneath. In addition, the use of a vertical screw is advantageous in that it does not allow for a sudden dropping of the furniture piece.

An advantage of the aspect which utilizes a first and second horizontally spaced hook for engaging a first and second office panel is that it provides better distribution of the lifting force by applying it to two panels instead of one.

An advantage of the preferred embodiments wherein the engagement elements are adapted to be attached at various heights along the lifting body is that it gives the user more flexibility in what height the engage the office furniture.

The present invention, together with attendant objects and advantages, will be best understood with reference to the detailed description below in connection with the attached drawings.
BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side view of a preferred embodiment of the system of the present invention.

Figure 2 is a sectional view of the preferred embodiment of the system of the present invention taken along line 2-2 in Figure 1.

Figure 3 is a sectional view of the preferred embodiment of the system of the present invention taken along line 3-3 in Fig 2.

Figure 4 is a view similar to that in Figure 3 with the system of the present invention in a raised position.

Figures 5 and 5a are a perspective view and side view, respectively, of a second preferred embodiment of the furniture engagement element of the present invention which can be used with the system of the present invention to lift office furniture.

Figures 6 and 6a are a perspective view and side view, respectively, of a third preferred embodiment of the furniture engagement element of the present invention which can be used with the system of the present invention to lift office furniture.

Figure 7 is a perspective view of a alternate embodiment of the system of the present invention.

Figure 8 is a sectional view of the alternate embodiment of the system of the present invention taken along line 2-2 in Figure 7.

Figure 9 is a sectional view of the preferred embodiment of the system of the present invention taken along line 3-3 in Fig 8.

Figure 10 is a view similar to that in Figure 9 with the system of the present invention in a raised position.

Figure 11 is a perspective view of another alternate embodiment of the furniture engagement element of the present invention which can be used with the system of the present invention to lift office furniture.
Figure 12 is a perspective view of a yet another alternate embodiment of the furniture engagement element of the present invention which can be used with the system of the present invention to lift office furniture.

Figure 13 is a perspective view of a panel lock plate for holding office panels together while lifted.

Figure 14 is a perspective view of an alternate embodiment of a panel lock plate for holding office panels together while lifted.

Figure 15 is a perspective view of another alternate embodiment of a panel lock plate for holding office panels together while lifted.

Figure 16 is a top view of a preferred engagement element.

Figure 17 is a side view of the engagement element shown in Figure 16.

Figure 17a is a view similar to Figure 17 showing engagement of a slotted standard.

Figure 18 is a top view of an alternatively preferred engagement element that is shaped to engage an office panel with slots set at a different angle.

Figure 19 is a side view of the engagement element shown in Figure 18.

Figure 20 is a top view of an engagement wedge.

Figs 21 and 22 are different side views of the engagement wedge of Figure 20.

Figure 23 is a perspective view of another preferred engagement element.

Figure 24 is a side view of the engagement element of Figure 23.
Figure 25 is top view of the engagement element of Figure 23.

Figure 26 is a front side view of the engagement element of Figure 23.

Figure 27 is a perspective view of yet another preferred engagement element.

Figure 28 is a side view of the engagement element of Figure 27.

Figure 29 is a top view of the engagement element of Figure 27.

Figure 30 is a front side view of the engagement element of Figure 27.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 is a side view of a first preferred embodiment of the system of the present invention. In this embodiment, the system 10 includes a base 12. The base 12 is preferably 3\(^{\frac{1}{2}}\) x 3' and defines an opening 1\(^{\frac{3}{4}}\) in diameter. An inner frame 16 is connected, preferably by a weld (not shown), over the opening in the base 12. The inner frame 16 is preferably made from an aluminum alloy 1\(^{\frac{1}{2}}\) O.D. x 1\(^{\frac{1}{4}}\) I.D. The device 10 also includes a lifting body or outer frame 18, preferably made from a 2' 2" x 2" x 1\(^{\frac{1}{4}}\) aluminum box tubing, that axially overlaps the inner frame 16. The lifting body 18 preferably has an engagement face 19. The engagement face 19 of the lifting body 18 includes slots 14 (Figure 2) that are shaped to receive removable and interchangeable furniture engagement elements 22 (only one shown) for lifting various types of office furniture. In the presently preferred embodiment, the slots 14 are 5/8' in length and 1/8' in width.

The presently preferred embodiment of the furniture engagement element 22 includes an attachment end 24 having at least one hook 23 (shown in phantom lines) for connecting to the engagement face 19, thereby maintaining the furniture engagement element 22 in fixed relation to
the lifting body 18. The furniture engagement element 22 also includes an engagement end 28 which defines a plurality of hooks 25 for mating with slots on a piece of furniture to be lifted.

Further preferred embodiments of the furniture engagement element 22 of the present invention are described with reference to Figures 5 and 6. The furniture engagement element 60 of Figure 5 includes an attachment end 62 having at least one hook 63 (Figure 5a) for connecting to the engagement face 19 (Figure 1), thereby maintaining the furniture engagement element 60 in fixed relation to the lifting body 18. The furniture engagement element 60 includes an engagement end 66 substantially perpendicular to the attachment end 62 and having vertical members 68 substantially parallel to the attachment end 62.

The furniture engagement element 70 of Figure 6 includes an attachment end 72 having at least one hook 73 (Figure 6a) for connecting to the engagement face 19 (Figure 1), thereby maintaining the furniture engagement element 70 in fixed relation to the lifting body 18. The furniture engagement element 70 includes an engagement end 76 substantially perpendicular to the attachment end 72 and defines a slot 78. The particular type and amount of furniture engagement elements 22, 60, 70 used with the system 10 at one time will depend on the type of furniture to be lifted.

Referring now to Figure 1, attached to the top surface of the lifting body 18 of the presently preferred embodiment of the system 10 is a horizontally moveable member 30. The member 30 provides further support for the piece of furniture lifted. Preferably, the member 30 is attached to the lifting body 18 in a manner to substantially prevent movement in a vertical direction between the member 30 and the lifting body 18. The member 30 is preferably L-shaped made from ultra high molecular weight (UHMW) angle polyethylene. Attached between the member 30 and the lifting body 18 is a means 31 (Figure 3) for lockingly adjusting the position of the member 30.
relative to the lifting body 18. Preferably, the means 31 includes a ratchet mechanism 31a attached to either the member 30 or lifting body 18 and a pawl mechanism 31b attached to the other of either the member 30 or lifting body 18. Preferably, either the ratchet mechanism 31a or the pawl mechanism 31b is resiliently mounted to urge the two mechanisms toward each other. Attached to either the ratchet mechanism 31a or the pawl mechanism 31b is a lever 32 (Figure 2) for unlocking the position of the member 30 relative to the lifting body 18. The ratchet mechanism 31a and pawl mechanism 31b are well known in the art and are commonly available from many sources.

Also shown in Figure 1 is an engagement element lock 29. Preferably, the lock 29 is a substantially square piece of steel that fits around the lifting body 18 and rests upon a furniture engagement element 22,60,70 to maintain the furniture engagement element 22,60,70 fixedly secured to the engagement 19 of the lifting body 18.

The details of the operation of the system 10 of the present invention are most clearly seen by reference to Figures 3 and 4. In the presently preferred embodiment, as shown in Figure 3, the inner frame 16 has a threaded opening 46 at the top of the frame 16 for receiving a threaded rod 38. The threaded rod 38 is preferably a 10-3\textsuperscript{4}, \( \frac{3}{4} \)-16 Acme All. Preferably, the threaded rod has four threads per inch. The threaded rod 38 is rotatably mounted to the lifting body 18, preferably using an aluminum mounting block with a brass bushing and thrust bearings. Preferably, the thrust bearing is a torrington bearing. Connected to the top of the threaded rod 38 is a first gear 42, preferably a Boston gear model no. L110Y available from American Bearing and Power Transmission located in Charlotte, North Carolina. A second gear 44, preferably a Boston gear model no. L110Y is rotatably attached to the lifting body 18 and registers with the first gear 42. Rotation of the second gear 44 by turning a knob 48 rotates the first gear 42.
and the threaded rod 38 within the threaded opening 46 of the inner frame 16. The rotation of the threaded rod 38 within the threaded opening 46 of the inner frame 16 causes the rod 38 and the lifting body 18 to move with respect to the inner frame 16. Figure 4 illustrates the result of turning the knob 48 in a direction such that the threaded rod 38 and the lifting body 18 move up with respect to the inner frame 16.

In an alternate embodiment (not shown) of the system of the present invention, the threaded rod may be mounted to the inner frame instead of the lifting body. Likewise, the threaded opening may be rotatably mounted to the lifting body instead of the inner frame.

Figures 7-12 depict another alternative embodiment of the present invention. The main difference between this alternative embodiment of Figures 7-12 and that of Figures 1-6 is the means for attaching the engagement elements. In particular, while the preferred embodiment uses hooks 23 on the elements 22 which are inserted within slots 14 on the lifting body 18, the alternative embodiment uses protrusions 120 which receive apertures 127 on the engagement elements.

Figure 7 is a perspective view of the alternative embodiment of the system of the present invention. In this embodiment, the system 110 includes a base 112. The base 112 is preferably 3½" x 3" and defines an opening 1½" in diameter. An inner frame 116 (Figure 8) is connected, preferably by a weld 114, over the opening in the base 112. The inner frame 116 is preferably made from an aluminum alloy 1½" O.D. x 1¼" I.D. The device 110 also includes a lifting body or outer frame 118, preferably made from a 12' 2" x 2" x ¾" aluminum box tubing, that axially overlaps the inner frame 116. The lifting body 118 preferably has an engagement face 119. Attached to the engagement face 119 of the lifting body 118 are protrusions 120 that are shaped to receive removable and interchangeable furniture engagement elements 122 (only one shown) for lifting various types of office
furniture. In the presently preferred embodiment, the protrusions 120 are \( \frac{3}{8}'' \) length, \( \frac{1}{4}'' \) -20 flathead. Threadably received within the protrusions 120 are retaining members 150 (Figure 9), preferably \( \frac{1}{4}'' \) in length and \( \frac{5}{8}'' \) in diameter. Preferably, the flange portion 121 of the protrusion 120 has a .6150'' diameter and is countersunk to receive the retaining member 150 (Figure 9). Preferably, the stud portion 123 of the protrusion 120 has a .34'' diameter.

The alternative embodiment of the furniture engagement element 122 includes an attachment end 124 having at least one opening for connecting to protrusion 120, thereby maintaining the furniture engagement element 122 in fixed relation to the lifting body 118. The furniture engagement element 122 also includes an engagement end 128 which defines a plurality of hooks 125 for mating with slots on a piece of furniture to be lifted.

Further alternative embodiments of the furniture engagement element 122 of the present invention are described with reference to Figures 11 and 12. The furniture engagement element 160 of Figure 11 includes an attachment end 162 having at least one opening for connecting to the protrusion 120 (Figure 13), thereby maintaining the furniture engagement element 160 in fixed relation to the lifting body 118. The furniture engagement element 160 includes an engagement end 166 substantially perpendicular to the attachment end 162 and having vertical members 168 substantially parallel to the attachment end 162.

The furniture engagement element 170 of Figure 12 includes an attachment end 172 having at least one opening for connecting to the protrusion 120 (Figure 13), thereby maintaining the furniture engagement element 170 in fixed relation to the lifting body 118. The furniture engagement element 170 includes an engagement end 176 substantially perpendicular to the attachment end 172 and defines a slot 178.
particular type and amount of furniture engagement elements 122, 160, 170 used with the system 110 at one time will depend on the type of furniture to be lifted.

Referring now to Figure 13, attached to the top surface of the lifting body 118 of the alternative embodiment of the system 110 is a horizontally moveable member 130. The member 130 provides further support for the piece of furniture lifted. The member 130 is preferably L-shaped made from ultra high molecular weight (UHMW) angle polyethylene. The position of the member 130 is adjusted by loosening a first knob 134 of a screw 136 (Figure 8) and sliding the member 130 into the desired position. The position of the member 130 is maintained by tightening the first knob 134 until the member 130 is not movable in relation to the lifting body 118.

The details of the operation of the system 110 of the present invention are most clearly seen by reference to Figures 9 and 10. In the presently preferred embodiment, as shown in Figure 9, the inner frame 116 has a threaded opening 146 at the top of the frame 116 for receiving a threaded rod 138. The threaded rod 138 is preferably a 10-32, ½"-16 Acme All. Preferably, the threaded rod has four threads per inch. The threaded rod 138 is rotatably mounted to the lifting body 118, preferably using an aluminum mounting block with a brass bushing and thrust bearings. Preferably, the thrust bearing is a torrington bearing. Connected to the top of the threaded rod 138 is a first gear 142, preferably a Boston gear model no. L110Y available from American Bearing and Power Transmission located in Charlotte, North Carolina. A second gear 144, preferably a Boston gear model no. L110Y is rotatably attached to the lifting body 118 and registers with the first gear 142. Rotation of the second gear 144 by turning a second knob 148 rotates the first gear 142 and the threaded rod 138 within the threaded opening 146 of the inner frame 116. The rotation of the threaded rod 138 within the threaded opening 146 of the inner frame 116 causes the
rod 138 and the lifting body 118 to move with respect to the inner frame 116. Figure 10 illustrates the result of turning the second knob 148 in a direction such that the threaded rod 138 and the lifting body 118 move up with respect to the inner frame 116.

In yet another alternate embodiment (not shown) of the system of the present invention, the threaded rod may be mounted to the inner frame instead of the lifting body. Likewise, the threaded opening may be rotatably mounted to the lifting body instead of the inner frame.

Figures 16 and 17 depict a preferred configuration for an engagement element 261. This engagement element 261 includes four attachment hooks 263 which can be inserted within the attachment slots 14 (See Figure 2) on the engagement face 19 of the lifting body 18. A single hook 265 is included on the engaging portion of this engagement element 261. Just above the hook 265 is a cut-out 267. The element also includes engagement faces 271 and 273 above and below the hook 261 respectively. As shown in Figure 17a, the engagement faces 271 and 273 are adapted to bear against the face of the slotted standard 275 of the office panel so as to stabilize the panel during lifting and to reduce torsional forces on the hook 265. A bend 269 is included in the engagement element 261 to strengthen the element.

Figures 18 and 19 show an engagement element 281 similar to the engagement element 261 except that the bend 289 is different. The element 285 is adapted to be used with office panels having slotted standards that set the slots at 45° angles. Thus, the bend 289 is configured to put the attachment hooks 283 at a 45° angle with respect to the engagement hook 285.

Figures 20-22 show an engagement wedge 301 adapted to be used with the engagement elements 261 and 281. The wedge 301 is L-shaped, preferably with legs 303 and 305 of equal length. Each of the legs is
tapered as shown. Preferably, the top surface of each of the legs is knurled, or otherwise treated to provide a good grip when inserted within a slot of a slotted standard.

As shown in Figure 17a, the engagement wedge 301 is adapted to be inserted into the slot 279 of the slotted standard 275 just above the slot 277 where the engagement hook 265 has been inserted. The wedge 301 is conveniently inserted within the cut-out 267. As shown, the engagement wedge has a tapered profile so that it is received within the slot 279 with an interference fit. The function of the engagement wedge is to reinforce the slotted standard for lifting by the hook 265. In particular, with the wedge fit tightly within the slot 279, the hook exerts a lifting force against the section 266 and 268 of the slotted standard. Naturally, without the engagement wedge, the hook would exert a lifting force against section 266 only.

Figure 23 is a front perspective view of another preferred engagement element 331. In this configuration, the element 331 includes a bracket 333 with a back wall 332, and two side walls 334 and 336. Captured within apertures in the side walls are two rods 335 and 337. Preferably, the rods are held in place by snap rings 355. A first hook plate 339 with the hook 345 includes apertures 351 and 353 which receive the rods 335 and 337. Likewise, a second hook plate 341 with the hook 343 includes apertures 347 and 349 which receive the rods 335 and 337. Thus, the hook plates 339 and 341 are allowed to slide along the rods 335 and 337 to thereby have the horizontal distance between each other adjusted. As a result, the hooks 345 and 343 can each be inserted into a slot of a slotted standard in adjacent office panels and adjusted sideways to account for different spaces between the slotted standards.

As seen in Figures 24 and 25, a series of 4 vertically aligned attachment hooks 359 are attached to the back wall 332 of the bracket.
this way, the engagement element 331 is attached to the engagement face 19 of the lifting body 18 (See Figure 2).

Figures 27-30 show the most preferred embodiment of an engagement element 371 for use in the present system. As shown, the element 371 includes a plate 373 with hooks 374 on its back surface for mating with the slots 14 in the engagement face 19 of the lifting body 18 (see Figure 2). Attached to the plate 373 is a block 375. The block 375 is preferably machined to have two cylindrical holes 376 and 378 and two slots 382 and 384. Fit within the round holes are two pivoting cylinders 381 and 383. Passing through and rigidly connected to the pivoting cylinders 381 and 383 are the rods 377 and 379, which thereby pivot with the cylinders. As the rods 377 and 379 pass through the slots 382 and 384, respectively, the top and bottom of the slots 382 and 384 limit the pivoting angle of the rods and the cylinders. Preferably, the rods are allowed to pivot about 30 degrees above or below a horizontal line.

Slidably received on one side of the rods 377 and 379 is a first hook assembly 411. The first hook assembly includes a plate 385 attached to a block 390. The plate 385 includes a hook 386. The block 390 includes two cylindrical holes 421 and 423 and two slots 398 and 399. Pivoting cylinders 389 and 391 are received within the holes 423 and 421 respectively. Passing through the pivoting cylinders 423 and 421 are the rods 377 and 379 respectively. The rods are slidably received so as to allow the hook assembly 411 to slide sideways along the rods. Snap rings 405 keep the hook assembly 411 from sliding off the end of the rods.

Slidably received on the other side of the rods 377 and 379 is a second hook assembly 413. The second hook assembly includes a plate 387 attached to a block 392. The plate 387 includes a hook 388. The block 392 includes two cylindrical holes 425 and 427 and two slots 401 and 402. Pivoting cylinders 393 and 395 are received within the holes 427 and 425.
respectively. Passing through the pivoting cylinders 427 and 425 are the rods 377 and 379 respectively. The rods are slidably received so as to allow the hook assembly 413 to slide sideways along the rods. Snap rings 405 keep the hook assembly 413 from sliding off the end of the rods.

The engagement element shown in Figures 27-30 is presently the most preferred embodiment for an engagement element for use in lifting office panels with slotted standards because it allows one to engage the slotted standard of two adjacent panels. In addition, the lateral sliding of the two hook assemblies allows one to adjust the horizontal distance between the hook to thereby account for difference spacing between the slotted standards. Moreover, this element also provides an automatic adjustment of the relatively height between the first and second hooks to thereby account for a vertical offset between the slotted standards of adjacent panels.

While the element depicted in Figures 27-30 has been shown with the hooks 374 for attachment to the more preferred lifting body, i.e. with slots on the engaging face, the element can also be equipped with other means for attaching the lifting body. For example, the place 373 can be configured with apertures such as those shown at 161 or 171 in Figures 11 and 12 for attachment to protrusions such as those shown at 120 in Figure 7.

The systems of the present invention are adapted to lift at least two office panels that are attached to each other at adjacent ends. Figures 13, 14 and 15 illustrate panel lock plates that can be used to secure two panels together during lifting. In operation, a first plate 180, 182, or 184 is used to span two office panels on one side. A second plate (not shown), preferably identical to the first plate 180, 182, 184 is used to span the two office panels on the opposite side. Drawing mechanisms (not shown), preferably %20 All Threads are used to draw the first and second plates together, thus clamping the office panels together. Plates 180, 182 and 184 are preferably made from hot rolled steel. Plate 180 (Figure 13) has a first
portion 180a and a second portion 180b. Both portions 180a and 180b are preferably 3¾" in length. Preferably, the first portion 180a defines two oblong slots and four ¼"-20 threaded openings. Second portion 180b preferably defines two ¼"-20 threaded openings. Preferably, both portions 180a and 180b have two 3¾" in length 1/8" x 1" rubber strips 181 fixedly attached thereto. Plate 182 (Figure 14) preferably defines two openings and has two rubber strips 183 fixedly attached thereto. Plate 184 (Figure 15) preferably defines six ¼"-20 threaded openings and two oblong slots, and has two rubber strips 185 fixedly attached thereto.

While all of the embodiments have been shown using the preferred lifting mechanism of a vertical screw, it is noted that other lifting mechanisms are available. For example, the jacking mechanism shown in U.S. Patent No. 5,385,335, the entire disclosure of which is incorporated herein by reference, can be used.

It should be understood that a wide range of changes and modifications can be made to the preferred embodiment described above. It is therefore intended that the foregoing detailed description be regarded as illustrative rather than limiting and that it be understood that it is the appended claims, including all equivalents, which are intended to define the scope of this invention.
WE CLAIM:

1. A jack for temporarily lifting pieces of office furniture comprising a base which rests upon a floor, and a lifting body movably attached to the base and adapted to be raised and lowered in a generally vertical direction, said lifting body adapted to engage a piece of office furniture and thereby lift it when raised, wherein one of the base or the lifting body includes a vertical screw attached thereto, and wherein the other of the base or the lifting body includes a threaded opening attached thereto, whereby the lifting body and thus the piece of office furniture is raised and lowered by relative rotation between the vertical screw and the threaded opening.

2. The jack of claim 1 further comprising at least one furniture engagement element having an engagement end adapted to engage and hold a piece of office furniture during lifting, the engagement element further adapted to be removably and interchangeably attached to the lifting body.

3. The jack of claim 2 wherein said at least one furniture engagement element includes hooks which mate with slots on a piece of office furniture.

4. The jack of claim 2 wherein said at least one furniture engagement element includes at least one prong that fits underneath a lower edge of a piece of office furniture.

5. The jack of claim 2 having a plurality of said furniture engagement elements attached to the lifting body.
6. The jack of claim 2 wherein the at least one engagement element includes at least one hole, wherein the lifting body includes at least one protrusion, and wherein the at least one engagement element is held on the lifting body by placing the at least one protrusion into the at least one hole.

7. The jack of claim 1 wherein the base is telescopically received within the lifting body.

10 8. A device for lifting office furniture comprising:
an inner frame defining a threaded opening perpendicular to a vertical axis;
an outer frame in telescopic relation to said inner frame, said outer frame including at least one protrusion affixed thereto shaped to receive at least one furniture engagement element for lifting furniture;
a threaded rod rotatably mounted to said outer frame and registering with and extending through said threaded opening in said inner frame;
a first gear affixed to a top portion of said threaded rod; and
a second gear rotatably attached to said outer frame and registering with said first gear, whereby rotation of said second gear rotates said first gear and said threaded rod, the rotation of said threaded rod within said threaded opening causing said threaded rod and said outer frame to move with respect to said inner frame.

25 9. The device of claim 8 wherein said at least one furniture engagement element includes an engagement end adapted to engage and hold a piece of office furniture during lifting, the engagement element further adapted to be removably and interchangeably attached to the outer frame.
10. The system of claim 9 wherein said at least one furniture engagement element includes hooks which mate with slots on a piece of office furniture.

11. The system of claim 9 having more than one furniture engagement element including hooks and wherein the hooks on each of said devices with hooks is configured to mate with the slots on pieces of office furniture with slots of a different configuration.

12. The system of claim 9 wherein at least one said furniture engagement element includes at least one prong that fits underneath a lower edge of a piece of office furniture.

13. The system of claim 9 having more than one said furniture engagement element attached to the outer frame.

14. The system of claim 9 wherein said at least one engagement element includes at least one hole, wherein the outer frame includes at least one protrusion, and wherein the at least one engagement element is held on the outer frame by placing the at least one protrusion into the at least one hole.

15. The system of claim 8 having a furniture support member movably attached to the outer frame and adapted to move in a generally horizontal direction.
16. A system for temporarily lifting pieces of office furniture comprising:

   a base which rests upon a floor;
   a lifting body movably attached to the base and adapted to raise and lower in a generally vertical direction, said lifting body including an engagement face defining at least one slot, and

   a plurality of furniture engagement elements, each with an engagement end adapted to engage and hold a piece of office furniture during lifting, each of said engagement elements adapted to be removably and interchangeably attached to the engagement face of the lifting body through said at least one slot.

17. The system of claim 16 wherein said plurality of furniture engagement elements each include an attachment end having at least one hook which mates with said at least one slot.

18. The system of claim 17 wherein the engagement face defines a plurality of slots and wherein each of the engagement elements includes a plurality of hooks.

19. The system of claim 16 wherein said engagement end is configured differently on each of said engagement elements, whereby pieces of office furniture of different types can be lifted by selecting the appropriate engagement element from the plurality of furniture engagement elements and attaching the engagement element to said engagement face.

20. The system of claim 16 wherein said engagement end of at least one of said furniture engagement elements includes hooks which mate with
preferably L-shaped made from ultra high molecular weight (UHMW) angle polyethylene. Attached between the member 30 and the lifting body 18 is a means 31 (Figure 3) for lockingly adjusting the position of the member 30

slots on a piece of office furniture.

21. The system of claim 16 wherein at least one of said furniture engagement elements includes at least one prong that fits underneath a lower edge of a piece of office furniture.

22. The system of claim 16 having more than one of said furniture engagement elements attached to the engagement face of the lifting body.

23. The system of claim 16 further comprising a lock maintaining the furniture engagement element fixedly secured to the engagement face of the lifting body.

24. The system of claim 16 having a furniture support member movably attached to the lifting body and adapted to move in a generally horizontal direction.

25. The system of claim 24 further comprising a mechanism to lock the support member in engagement with a piece of office furniture, said mechanism comprising a ratchet rack mounted to either the furniture support member or the lifting body and a pawl mounted to the other of either the furniture support member or the lifting body.

26. The system of claim 16 wherein the lifting body is raised and lowered by a vertical screw.
27. The system of claim 26 wherein the vertical screw is rotatably attached to the lifting body and wherein the screw is received in a threaded opening attached to the base.

28. The system of claim 26 wherein the vertical screw is rotatably attached to the base and wherein the screw is received in a threaded opening attached to the lifting body.

29. A device for temporarily lifting at least two office panels each panel having a slotted standard, the device comprising:
   - a base which rests upon a floor;
   - a lifting body movably attached to the base and adapted to raise and lower in a generally vertical direction, and
   - a furniture engagement element comprising a first and second hook each attached to the lifting body and spaced horizontally whereby the first hook can be inserted into the slotted standard of a first office panel and the second hook can be inserted into the slotted standard of a second and adjacent office panel.

30. The device of claim 29 wherein the first hook is horizontally movable in relation to the second hook to thereby account for different spacing between the slotted standards of the first and second office panel.

31. The device of claim 29 wherein both of the first and second hooks are horizontally movable with respect to the lifting body to thereby account for different spacing between the slotted standards of the first and second office panel.
The device of claim 29 wherein the lifting body includes a horizontal rod and the first and second hooks are adapted to slide along the horizontal rod.

The device of claim 29 wherein the lifting body includes first and second vertically spaced horizontal rods and wherein each of the first and second hooks includes first and second apertures receiving the first and second horizontal rods respectively.

The device of claim 33 wherein the lifting body includes an engagement face and wherein the first and second horizontal rods are attached to a bracket and wherein the bracket is removably attached to the engagement face.

The device of claim 34 wherein the engagement face includes attachment slots and wherein the bracket includes attachment hooks which fit within the attachment slots.

The device of claim 35 wherein the attachment slots outnumber the attachment hooks and wherein the attachment slots are arranged in at least one vertical row whereby the bracket can be attached at different heights on the engagement face.

The device of claim 29 wherein the first hook is vertically adjustable with respect to the second hook to thereby account for a vertical offset between the slots in the slotted standard of the first panel and the slots in the slotted standard of the second panel.
element 170 in fixed relation to the lifting body 118. The furniture engagement element 170 includes an engagement end 176 substantially perpendicular to the attachment end 172 and defines a slot 178. The

38. The device of claim 29 wherein the lifting body includes a rod pivotally attached at its midpoint and wherein the first hook is attached to the rod on one side of the midpoint and the second hook is attached to the rod on the other side of the midpoint whereby the vertical position of the first relative to the vertical position of the second hook is automatically adjusted upon lifting a first and second office panel each having slots at different heights.

39. The device of claim 38 wherein the first and second hooks are each slidably attached to the rod so as to account for differing horizontal distances between the slots of the first and second panels.

40. The device of claim 38 wherein the first and second hooks are each slidably and pivotally attached to the rod so as to account for differing horizontal differences between the slots of the first and second panels and so as to allow the first and second hooks to remain vertical despite pivoting of the rod on the lifting body.

41. The device of claim 38 wherein the lifting body further comprises a second rod pivotally attached at its midpoint and wherein the first hook is attached to the second rod on one side of the midpoint and wherein the second hook is attached to the second rod on the other side of the midpoint.

42. The device of claim 41 wherein the first and second hook are each slidably attached to the first and second rods so as to account for differing horizontal distances between the slots of the first and second panels.
knob 148 rotates the first gear 142 and the threaded rod 138 within the threaded opening 146 of the inner frame 116. The rotation of the threaded rod 138 within the threaded opening 146 of the inner frame 116 causes the

43. The device of claim 41 wherein the first and second hooks are each slidably and pivotally attached to the first and second rods so as to account for differing horizontal differences between the slots of the first and second panels and so as to allow the first and second hooks to remain vertical despite pivoting of the rod on the lifting body.

44. A device for temporarily lifting an office panel having a slotted standard comprising:
   a base which rests upon a floor;
   a lifting body movably attached to the base and adapted to raise and lower in a generally vertical direction;
   a furniture engagement element attached to the lifting body and comprising a hook which is inserted into a first slot of the slotted standard; and
   an engagement wedge which is inserted into a second slot of the slotted standard, which second slot is immediately above the first slot, whereby the slotted standard is reinforced during lifting of the first hook.
engagement elements attached to the lifting body.
The system of claim 16 wherein said engagement end of at least one of said furniture engagement elements includes hooks which mate with
in the slotted standard of the second panel.
**INTERNATIONAL SEARCH REPORT**

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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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**Date of the actual completion of the international search**: 18 MARCH 1998

**Date of mailing of the international search report**: 27 APR 1998
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