

MOLDING DEVICE WITH HAND OPERABLE MOLDRELEASING MECHANISM

This invention relates to a molding device for concrete construction which can be released easily from a formed concrete structure and easily reset at another location for a next molding.

- 5 It is known in the art to provide molding devices which can be collapsed or contracted to be released from a formed concrete structure and can be stretched to a molding position. Various types of collapsible molding devices have been suggested in the art.
- 10 For example, U.S. Patent Numbers 2,544,297, 3,614,054, 3,934,808 and French Patent No. 2489206 disclose inner formwork boards used to form inner sides of multi-sided concrete walls. These formwork boards incorporate hydraulically operated linkage mechanisms which hold
- 15 and operate the formwork boards. U.S. Patent No. 4,679,762 of the inventor of this application discloses a form assembly which is used to form an enclosed multi-sided wall as shown in Figure 1 and includes component boards and wedge-shaped spacer boards which
- 20 are operated by a rack-and-gear mechanism including a plurality of worm wheels mounted on vertical shafts and horizontal shafts to drive rack members. To release this form assembly, the spacer boards must be moved inward simultaneously. When the spacer boards are
- 25 moved, the form boards on two sides of the spacer

boards also move simultaneously so that a great deal of force need be applied to simultaneously release the entire form assembly. Accordingly, a powerful hydraulic device is necessary for operation. Moreover, this form assembly is
5 suitable only for forming enclosed multi-sided walls.

According to the present invention, a molding device comprises at least two component form boards each having a first forming face and a first end face connected to the first forming face and forming an acute angle with the
10 first forming face; a spacer board between the component form boards having a second forming face and two second diverging end faces extending from the second forming face, the second end faces being abutted with and releasably connected to respective ones of the first end faces; means
15 for releasably connecting the component form boards to the spacer board; a respective operating unit associated with each of the component form boards and each respective second end face of the spacer board and being operable to move the component form board and the spacer board relative
20 to one another, the unit including a rack member mounted on the spacer board adjacent to the respective second end faces, a lever mounted on one of the component form boards for turning about a horizontal axis adjacent to the rack member, a pawl member connected with the lever to swing
25 about a horizontal axis which is eccentric with respect to the axis of the lever, the pawl member engaging with the rack member and being capable of displacing the rack member when the lever is operated.

In a secondary aspect of the invention, the operating
30 unit further includes a mounting seat mounted on the respective component form board, and having at least one mounting hole, the lever having a shaft removably inserted in the mounting hole and an elongate handle connected to the shaft for turning the shaft, the operating unit further
35 having an eccentric member fixed to the shaft, the pawl member having one end rotatably sleeved around the eccentric member.

The rack member may include a thick plate member having a top surface with rack teeth formed thereon and an upward edge flange thereon, the spacer board advantageously having an accommodating recess for removably receiving the rack member so as to change the position of the rack member as desired. Preferably, the pawl member has a free end which has two opposite edge teeth either of which can engage with the rack member depending on the direction of movement of spacer board relative to the component form board.

There may be a further pawl member mounted rotatably on the shaft adjacent to the pawl member, to prevent backward movement of the rack member when the lever is operated. This further pawl may also have a free end which has two opposed edge teeth, either of which can engage with the rack member depending on the direction of movement of spacer board relative to the component form board.

In the accompanying drawings:

Figure 1 is a schematic plan view showing the operation of a form assembly in the art;

Figure 2 is a schematic plan view showing a molding device of the present invention;

Figure 3 is a fragmentary perspective view of the molding device of Figure 2;

Figure 4 is a fragmentary sectional view taken along line 4-4 of Figure 3;

Figure 5 is a perspective view of an operating mechanism of the present invention;

Figure 6 is a sectional view of the operating mechanism of Figure 5;

Figures 7 and 8 show the operations of the operating mechanism of Figure 5;

Figure 9 shows another example of the rack member and the mounting seat of the invention; and

Figure 10 shows the operation of releasing the

molding device from the formed structure.

Referring to Figures 2 and 3, a molding device 11 for molding an inner side of a four-sided wall is shown, including two angled component form boards 12, 5 two angled component form boards 13 and four spacer boards 14 which are interconnected to establish a four-sided forming face for a four-walled room. Each spacer board 14 has a wedge-shaped cross-section and two diverging end faces 14a extending from a forming 10 face 14b of the spacer board 14. Each form board 12 has two inclined end faces 12a abutting with and connected releaseably to adjacent end faces 14a of the spacer board 14. Also, each form board 13 has two inclined end faces 13a abutting with connected 15 releaseably to adjacent end faces 14a of the spacer board 14. Support bases 12c, 13c and 14c are disposed respectively at the bottom sides of the form boards 12 and 13 and the spacer boards 14. Referring to Figure 4 in combination with Figure 3, each slanted side of 20 the base 12c or 13c is provided with an elongate groove 21 which has a restricted elongate opening 21a and receives an elongate bar 22 in a slideable position. Each bar 22 is connected through screws 23 to one side of the base 14c of each spacer board 14. The 25 bar 22 can be prevented from moving in the groove 21 by

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tightening the screws 23, thereby securing together the spacer board 14 and the adjacent form board 12 and 13.

On the base 14c of each spacer board 14 are mounted two rack members 18 near the end faces of the 5 spacer board 14. Each rack member 18 is a thick plate which is provided with teeth 19 at the top surface thereof and an upward stop edge flange 20. The rack member 18 is attached removably to the base 14c. The removable attachment may be accomplished by placing the 10 rack member in a recess 181 of the base 14c. Referring to Figures 5 and 6 in combination with Figure 3, an operating means 25 is mounted through a mounting seat 15 on one side of each base 12c or 13c adjacent to each rack member 18. The mounting seat 15 includes two raised 15 parts provided respectively with outer and inner journal holes 16 and 17 and a stop projection 15a. The stop projection 15a is used to engage with the stop flange 20 of the rack member so as to stop the movement of the rack member.

20 Referring to Figures 5 and 6, an operating means 25, to operably associate with the rack member, includes a lever 26 connected to an operating shaft 27 which can be inserted changeably in two mounting holes 16 and 17. An eccentric member 34 is mounted on the shaft 27 25 adjacent to the lever 26. A pawl member 28 is sleeved with one end thereof rotatably around the eccentric member 34. The free end of the pawl member 28 has two

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opposed edge teeth 29 and 30. Adjacent to the eccentric member 34 is another pawl member 32 which is mounted on an end portion of the shaft 27 to swing thereabout and which is prevented from escaping by means of a locking screw 36. The pawl also has two opposed edge teeth 32 and 33. By operating the levers 26, the spacer boards 14 can be moved relative to the adjacent form boards 12 or 13.

The operation of releasing the form of the invention is illustrated in Figure 10. Firstly, the two form boards 13 are moved inward by operating the levers 26 so as to move the spacer boards 14 in the directions shown by arrow A relative to the form boards 12. Then, the form boards 12 are moved in the directions shown by arrow B by moving inward the spacer boards 14 relative to the form boards 13. The movement of the two form boards 12 or 13 can be effected either simultaneously or successively.

The operation of the operating means of the invention is shown in Figures 7 and 8. When the spacer board 14 is to be moved in the direction opposite to direction A or B, the operating shaft 27 is inserted in the outer hole 16 of the mounting seat 15, the pawl member 18 is placed in the recess 181 of the spacer board 14 in such a manner that the upward flange 20 is directed toward the forming face 14b of the spacer board 14, and the edge tooth 30 of the pawl

member 28 is arranged to engage with the teeth 19 of the rack member, as shown in Figure 7. In this situation, the tooth 32 of the pawl 31 engages the rack member. When the lever is turned down, i.e. clockwise, 5 from the upward position as shown, the eccentric member 34 will cause the pawl member 28 to move slightly forward, thereby moving forward the rack member. When the lever turns counter-clockwise, the pawl member 28 moves rearward and engages with a next tooth of the rack 10 member. By turning upward and downward the lever 26, the rack member 18 can be moved in a direction shown by arrow 50 to cause the spacer board 14 and the form board 13 to move to their molding position. The movement of the rack member 18 stops when the flange 20 15 of the rack 18 contacts the projection 15a of the mounting seat 15. The tooth 32 of the pawl 31 prevents the backward movement of the rack member when the lever is operated.

When the spacer board 14 is to be moved in the 20 direction A or B, the shaft 27 is inserted in the hole 17 of the mounting seat 15, the position of the rack member 18 is changed so as to place the upward edge flange 20 away from the forming face 14b. In this situation, tooth 29 of the pawl member 28 and tooth 33 25 of the pawl 31 engage with the rack member 18. By operating the lever 26, the rack member 18 can be moved in a direction 51 opposite to direction 50 to

release the spacer board 14 or the form board 13 from the formed concrete structure.

Figure 9 shows an alternative mounting seat 80 and an alternative rack member 82 which can be used in the present invention. The mounting seat 80 includes a single mounting hole 81 into which the shaft 27 can be inserted for moving the rack member in two directions. The rack member 82 is received removably in the recess 181 of the base member 14c so that the rack member 82 can be detached from the base member 14c to change its position. Since a single hole is provided on the mounting seat 80, the length of the rack member 82 must be greater than that of the rack member 18.

While the teeth of the rack member 18 and 82 are arranged such that their position must be changed to be able to engage with the teeth 29 and 30 of the pawl arm 28 so as to move the rack members 18 and 92 in two directions, i.e. to a molding position and to a released position, the teeth of the rack member or the pawl used in the present invention may be arranged such that they are operative without changing the position of the rack member.

It can be appreciated that the form assembly according to the invention can be operated manually to move to a molding position or a position released from the molded concrete structure, and that the simultaneous operations of the two operating means of

9.

each form board 12 or 13 can move the form board 12 or 13 relative to the adjacent spacer boards 14.

CLAIMS

1. A molding device comprising at least two component
form boards each having a first forming face and a first
5 end face connected to the first forming face and forming an
acute angle with the first forming face; a spacer board
between the component form boards having a second forming
face and two second diverging end faces extending from the
second forming face, the second end faces being abutted
10 with and releasably connected to respective ones of the
first end faces; means for releasably connecting the
component form boards to the spacer board; a respective
operating unit associated with each of the component form
boards and each respective second end face of the spacer
15 board and being operable to move the component form board
and the spacer board relative to one another, the unit
including a rack member mounted on the spacer board
adjacent to the respective second end faces, a lever
mounted on one of the component form boards for turning
20 about a horizontal axis adjacent to the rack member, a pawl
member connected with the lever to swing about a horizontal
axis which is eccentric with respect to the axis of the
lever, the pawl member engaging with the rack member and
being capable of displacing the rack member when the lever
25 is operated.

2. A molding device according to claim 1, wherein each
operating unit further includes a mounting seat mounted on
the respective component form board, and having at least
30 one mounting hole, the lever having a shaft removably
inserted in the mounting hole and an elongate handle
connected to the shaft for turning the shaft, the operating
unit further having an eccentric member fixed to the shaft,
the pawl member having one end rotatably sleeved around the
35 eccentric member.

3. A molding device according to claim 2, wherein the



mounting seat includes two mounting holes and the shaft of the lever can be changeably inserted in the mounting holes so as to selectively move the component form boards to and from a deployed position with the pawl member reversed.

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4. A mounting device according to claim 2 or claim 3, wherein the rack member includes a thick plate member having a top surface with rack teeth formed thereon and an upward edge flange thereon for engagement with a stop
10 projection on the mounting seat, the spacer board having an accommodating recess for removably receiving the rack member so as to change the position of the rack member as desired.

15 5. A molding device according to any one of claims 2 to 4, wherein the operating unit includes a further pawl member mounted rotatably on the shaft adjacent to the pawl member, to prevent backward movement of the rack member when the lever is operated.

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6. A molding device according to any one of the preceding claims, wherein the pawl member has a free end which has two opposed edge teeth, either of which can engage with the rack member depending on the direction of movement of the
25 spacer board relative to the component form board.

7. A molding device according to claims 5 and 6, wherein the further pawl also has a free end which has two opposed edge teeth, either of which can engage with the rack member
30 depending on the direction of movement of spacer board relative to the component form board.

8. A molding device as substantially described hereinbefore with reference to the accompanying drawings.

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