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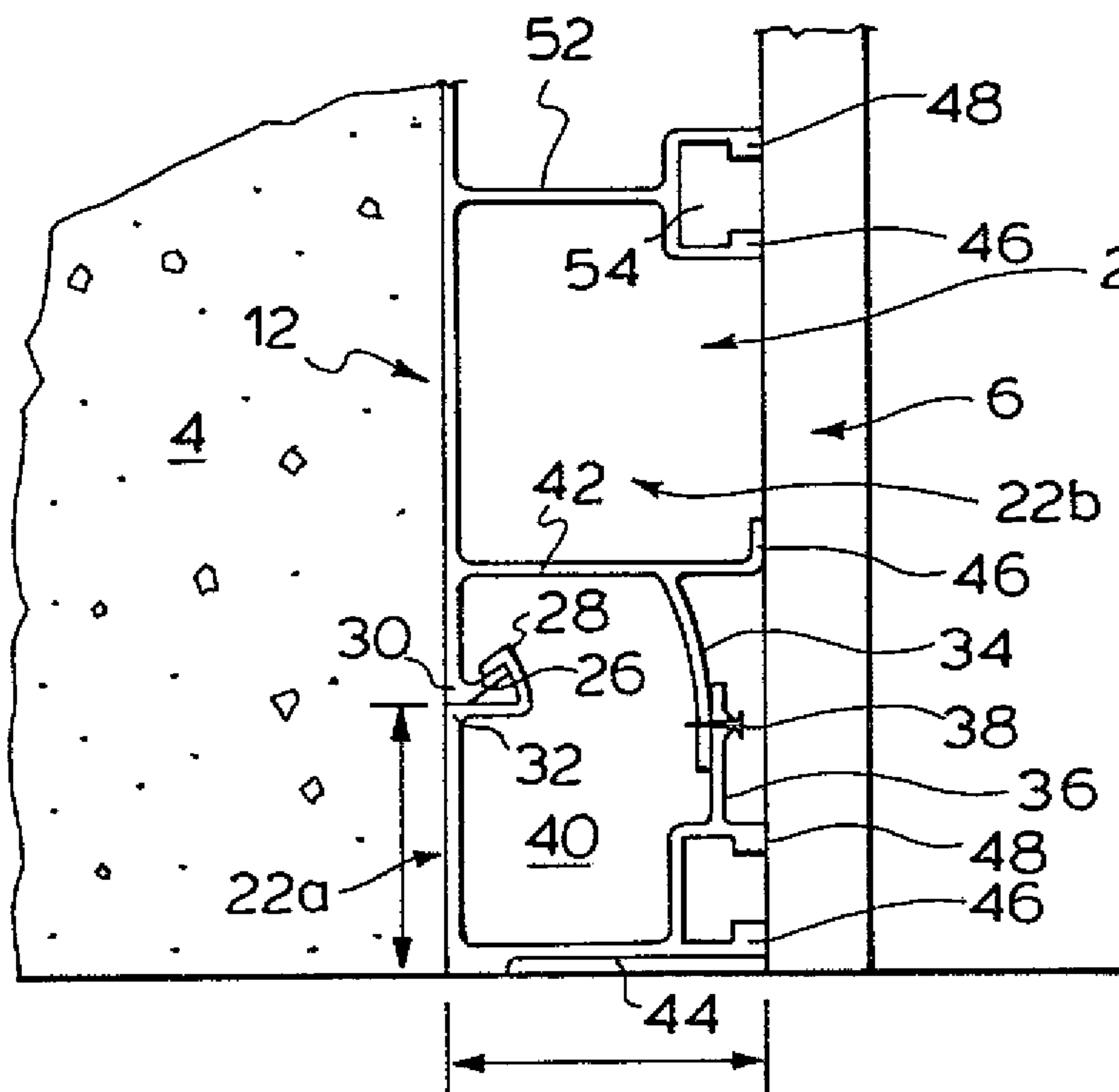
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(54) Title: MODULAR CONCRETE WALLFORM



(57) Abrégé/Abstract:

A concrete wallform section is made up of at least two connected panels which cooperate to form a concrete engaging face. The panels are joined adjacent the concrete engaging face by a continuous mechanical hook and slot arrangement, which itself is maintained by cooperating connected flanges of the panels. The flanges and the hook and slot arrangement form a box-like cell at a junction of the two panels. A concrete wallform system according to the invention utilizes individual extended panels which are interconnected to form wallform sections. The width of the wallform sections can be increased by adding an intermediate panel or panels. This simplifies manufacture and allows convenient repair, replacement or salvaging in the field.

ABSTRACT OF THE DISCLOSURE

A concrete wallform section is made up of at least two connected panels which cooperate to form a concrete engaging face. The panels are joined adjacent the concrete engaging face by a continuous mechanical hook and slot arrangement, which itself is maintained by cooperating connected flanges of the panels. The flanges and the hook and slot arrangement form a box-like cell at a junction of the two panels. A concrete wallform system according to the invention utilizes individual extended panels which are interconnected to form wallform sections. The width of the wallform sections can be increased by adding an intermediate panel or panels. This simplifies manufacture and allows convenient repair, replacement or salvaging in the field.

TITLE: MODULAR CONCRETE WALLFORMBACKGROUND OF THE INVENTION

Many different wallform systems are commonly used to produce a host of different concrete structures. These wallform systems are assembled prior to pouring of the concrete and then receive the concrete and essentially maintain the concrete and define certain exterior surfaces of the concrete structure. Concrete forms have been used for many years and typically had a plywood concrete-engaging surface that was suitably reinforced. To reduce damage, often the plywood would include a frame thereabout of steel or other material and a number of these frames could be joined in an abutting manner to form a longer concrete form. Framed steel wallforms with a metal face are also used and are typically joined by a tensioning member passing through ports in the frame.

Unfortunately, the life of the concrete wallform section is not particularly long and there can be a substantial amount of waste or scrap material with such systems which can be difficult to recycle. To avoid this problem there have been a number of systems which are made of aluminum and can be recycled. Systems made of aluminum can be recycled easily and have a high scrap value particularly relative to steel systems. Typically, each of these systems have a large integral section formed by casting or extrusion. These sections can then be joined in the field as part of the larger system. Joining is by mechanical fasteners extending through ports in side flanges and forming a clamping action. To make this practical, these units are fairly large and the extrusion process and the extrusion dies tend to be expensive. With these metal type systems, if any part of the panel section becomes damaged, the panel can be recycled. Unfortunately, these systems are prone to damage due to their intended purpose, which requires assembly, knock-down, storage and transportation, and damage can occur in any of these

functions. Extruded sections typically have a large reinforcing flange at the sides thereof with ports therein for fastening sections into a wallform.

There remains a need for a simple wallform system which can be effectively manufactured, repaired in the field, provide flexibility in the various different forms that can be made and can be effectively recycled.

SUMMARY OF THE INVENTION

A concrete wallform section according to the present invention comprises at least two connected panels which cooperate to form a planar concrete engaging face. The connected panels are joined adjacent the concrete engaging face by a mechanical hook and slot arrangement. The mechanical hook and slot arrangement is maintained by mechanical fastening arrangement spaced rearwardly of said hook and slot arrangement. The mechanical fastening arrangement maintains the panels in aligned condition.

In a preferred embodiment, the mechanical fastening arrangement includes overlapping flanges of adjacent panels located at a space distance rearwardly of the concrete engaging face. The flanges are mechanically secured and cooperate with the panels to form a box-like cell at a junction of two joined panels. The mechanical securement of the panels maintains the hook and slot connection of the panels. The concrete wall form section may then be coupled and secured with other wall form sections to form a concrete wallform system. The hook and slot connection between adjacent panels aligns the panels to form the planar concrete face.

According to an aspect of the invention, the hook and slot arrangement are initially connected at an angle and rotated to an assembled condition collectively defining a concrete engaging surface of the wallform section.

According to a further aspect of the invention, the hook and slot arrangement have associated therewith opposed

shoulders on each panel which abut and form a tight joint when the panels are rotated to the assembled condition.

According to yet a further aspect of the invention, the overlapping flanges cooperate to define a clear separated position when the hook and slot arrangement are in the angled assembly position and the flanges overlap and abut when the panels are rotated to the assembled condition defining the concrete engaging face.

According to yet a further aspect of the invention, one of the panels is an intermediate panel and the intermediate panels includes a hook at one edge thereof and a slot arrangement at the opposite edge thereof and a reinforcing web member extending rearwardly from the concrete engaging surface intermediate the hook and slot arrangement.

According to yet a further aspect of the invention, the flanges and the reinforcing web have rear support surfaces at the same distance from the concrete engaging surface for engaging a strong back member.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings where;

Figure 1 is a side schematic of the concrete wallforming system with the panels in a generally horizontal orientation and Figure 1a shows additional detail;

Figures 2 and 3 are partial perspective views showing various assembled panels reinforced by strong back members at the rear surface thereof and the panels form part of a wallform system;

Figure 4 is a sectional view of a 350 mm wallform section;

Figure 5 is a partial sectional view showing a wall form section clamped to a corner wall section;

Figure 6 is a sectional view of a 550 mm panel having two intermediate panels;

Figure 7 is a sectional view of a 750 mm wall form section;

Figure 8 shows two panels in a bent configuration subsequent to the case when the panels are initially joined;

Figure 9 shows how the one panel is then rotated to a final position;

Figure 10 shows an enlargement of the connected panels and;

Figure 11 shows how the hook and slot arrangement and overlapping flanges cooperate to allow insertion of the hook in the slot.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The concrete wall form as shown in Figure 1 is made up of a number of horizontally disposed panels which are suitably continuously connected in an edge to edge manner. The wallform to one side is normally planar and forms a face which imprints the concrete of a face of the structure. To the rear of the concrete wallform is a strong back arrangement 6 which maintains the wallform in the vertical orientation. A tie plate 8 is shown which receives a tie rod 10. The cooperation of the strong back, tie plate and tie rod is conventional and maintains the wallform configuration. Details of the concrete wallform section are shown in Figures 4 through 11. Basically, a number of wallform sections are mechanically fastened in the field to form the concrete wall form 2. Each concrete wall form section comprises a number of panel sections as will be more fully described.

The perspective views of the Figures 2 and 3 show details of the concrete wallform and its relationship with the strongback members 6. The concrete wallform includes a concrete imprinting face 12.

Figures 4 through 11 show additional details of the panel sections and the cooperation therebetween. Figure 4 shows a standard 350 mm panel preferably of aluminum comprising a left end panel section 22a, an intermediate

panel section 22b, and a right end panel section 22c. The panel sections are joined at panel junctions, generally shown as 24. Adjacent the panel junctions, the panel sections cooperate to form a box-like cell 40, which serves to maintain the particular panel connection. The actual connection includes a hook 26 which is received within a slot 28 of an adjacent panel section. These panel sections have abutting shoulders 30 and 32 which form a tight continuous joint. Overlapping flanges 34 and 36 are secured in the final position by a rivet or screw 38. With this mechanical securement, the box-like cell 40 is complete and will oppose forces exerted on the concrete wallform section and particularly forces exerted on the hook and slot arrangement. It can further be appreciated that the load exerted by the concrete will try to bow the concrete engaging face 12 inwardly and this is opposed by the box-like cell 40, which acts as a column. This concrete load further increases the load maintaining abutment of shoulders 30 and 32. This produces a very shallow seam which does not significantly imprint the concrete. The rigidity of the system is accomplished using thin walled extrusions which cooperate to form the box-like cells having high load capability.

The overlapping flanges 34 and 36 are spaced rearwardly of the concrete engaging face 12 by means of webs 42 and 44. Web 44 can include bolt slot 49 at the rear surface thereof and also includes faces 46 and 48 which are at the same distance as flange 46 on web 42. This results in the wallform section having a number of rear support surfaces 46, 48 which engage the strongback member. The wallform section has a reinforcing rib adjacent a box-like cell adjacent a reinforcing rib, adjacent a box-like cell, etc. This provides high strength. A number of these standard wallform sections, such as that shown in Figure 4, may be assembled and disassembled and have a continuous connection at the hook and slot junction. The individual panels are maintained in their assembled condition, i.e. the

screws 38 are maintained and the hook and slot arrangement are maintained in engagement. The wallform sections may be brought into engagement and cooperate with other wallform sections by means of the mechanical clamping arrangement 62, generally shown in Figure 5. As can be seen, both the left end panel section and right end panel section include end to end panel section connections 60 which are engaged by the mechanical clamp connector 62. Note that this clamp provides high compressive loads at the planar surface and can be vertically spaced as required.

The individual wallform sections are normally aligned at the bottom edge, but this need not be the case. For example, the sections could be shifted and secured to collectively define a slope. This is a further advantage of the hook and slot which can slide within each other as well as the clamp which merely grasps the edges of adjacent wallforms and does not rely on punched holes in the frame flanges. No fabrication of the unit panel itself is required prior to assembly and this results in low manufacturing costs. It should also be recognized that the panels do not need to be vertically oriented as shown. For example, the panels can be oriented horizontally or at other angles.

To add flexibility and to meet certain needs in the marketplace, additional wallform sections of greater expanse can be assembled and maintained. A 550 mm wallform section, as shown in Figure 6, and a 750 mm panel section is shown in Figure 7. These panel sections include additional intermediate panels 22b which can be ganged together. In addition to the left end panel section, right end panel section, there can be inside corner panel sections and outside panel sections. In this way, various panels can be assembled by means of this simple panel connection clamp 62 to form a complete wall form. Once the job is complete, the mechanical clamp 62 can be removed, the strongbacks removed, etc. and the system broken down into the wallform sections such as that shown in Figures 4, 6 and 7.

The concrete wallform system utilizes a number of standard components for building wallform sections of different widths. In this way, the manufacturing is simplified (smaller extruded components, less warpage) and greater flexibility in repair, assembly and salvage in the field is possible. For example, if an intermediate panel is damaged in the field, the wallform section may be repaired by removing the damaged section and reassembling, if desired, or by replacing the damaged section. Furthermore, any damaged panels can be recycled as opposed to recycling the entire wallform section. Any warpage in panel sections is reduced when panel sections are assembled into a wallform section. Warpage between abutting wallform sections is reduced by the clamp arrangement, which aligns and compresses at a position very close to the imprinting surface. Several clamp arrangements can be used to meet the load requirements and to provide reduce the visibility of joints in the final product.

Figures 8, 9, 10 and 11 show details of the mechanical connection of individual panels in the forming of a wallform section. In Figure 8, two intermediate wallform section panels are shown at a bent or angled configuration to allow the hook 26 to be inserted in the slot arrangement 28 with generous clearance to facilitate assembly and accommodate manufacturing tolerances (straightness) and minimize damage related to use. As can be see, the overlap and flanges are spaced from each other in this bent or angled configuration (see Figure 8 and Figure 11). Once the hook has been inserted in the slot arrangement, the panel sections may then be rotated into a generally planar or assembled condition as shown in Figures 9 and 10. To maintain this assembled condition, a rivet or screw 38 can pass through each of the overlapping flanges 34 and 36. Other arrangements for maintaining the flanges can be used. This assembly is convenient as the mechanical fastening position is easily accessible due to its significant spacing from the concrete imprinting face.

As can be seen, the hook and slot arrangement and the clearance of the flanges allows a very simple mechanical connection, i.e. rivet or screw 38 to maintain the extruded sections in the desired form. The abutting shoulders 30 and 32 maintain a tight continuous joint between panel sections and therefore, use of the form does not contaminate the connection. It can also be seen that the present invention allows for various intermediate panels to be ganged together to form wallform sections of greater width as desired. This arrangement is also adaptable for a repair in the field in a very simple manner. The mechanical connection 38 may be removed and the panels sections disassembled. This may be important if one becomes damaged or is desired to make up a longer concrete wallform section.

This design and in particular the mechanical section between panels sections overcomes certain difficulties known with extrusion manufacture, i.e. there can be slight twists etc. due to the extrusion process. The mechanical connection allows insertion even if there is somewhat of a twist of the hook and slot arrangement and the panels can then be forced into the finished position merely by completing the assembly operation eliminating the effect of the twist.

It has been found with this structure that the panel section can be relatively thin making it relatively low cost yet the structure has good stiffness. This is of advantage in that it simplifies the extrusion manufacturing process and also reduces cost due to the lower material requirements. The mechanical connection produces a tight face at the concrete engaging surface assembles fast and has an initial sloppy fit which eventually adjusts itself into the final tight continuous fit. The joint transmits shear in both directions and tends to stay together. It can also be seen that the concrete wallform sections are partially nestable in an offset manner and can be of a length of up to about 3 meters.

It can further be appreciated that if desired, the design can accommodate pre-stressing of the panels to produce somewhat of an outwardly bowed concrete face initially, which under concrete load will flatten out to the desired surface and further strengthen the joint. As shown in the diagrams, the wall sections used in this extrusion are of about 2 mm. A further advantage of this system is the fact that the wall form section is generally open at the back and allows partial nesting or insertion of one wallform section in the other in an opposed manner.

The clamp or panel connector 62 is made of a first extruded component 64 and a second extruded component 66. Component 66 includes two projecting flanges 68 which form a slot for restricting rotation of nut 70. The bolt 72 passes through ports in components 64 and 66 and engages nut 70. The components have a hinge connection 74 therebetween and opposed jaws 76 for clamping end to end panel connection 60 of adjacent abutting wall sections.

The clamp can be tightened or loosened by turning bolt 72 appropriately with a spanner or socket and ratchet. The adjustment is very accessible and convenient. The design which allows components 64 and 66 to be extruded also allows the height of the clamp, and thus, allows the gripping effect thereof to be selected for the desired effect and is cost effective to manufacture. The clamp also maintains its assembly when loosened and is easy to place on components 60 and draw the same into alignment. Clamps can also be placed wherever required and the position is not fixed at discrete positions by the wallform sections.

The box-like cell cooperation is also used at corners where two box cells cooperate to provide high strength at positions normally under high load.

Although preferred embodiments of the invention have been described herein in detail, it will be understood by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A concrete wallform section comprising at least two connected panels which cooperate to form a concrete engaging face, said interconnected panels being joined adjacent the concrete engaging face by a mechanical hook and slot arrangement which serve to align said panels, said panels including a mechanical fastening arrangement spaced rearwardly of said mechanical hook and slot arrangement and which maintains said mechanical hook and slot arrangement in a position aligning said panels.
2. A concrete wallform section as claimed in Claim 1, wherein said hook and slot arrangement form a continuous connection and are interconnected at an angle and rotated to a final position forming a concrete engaging surface of said wallform section with said panels aligned.
3. A concrete wallform section as claimed in Claim 2, wherein said hook and slot arrangement when said panels are aligned cause opposed shoulders of each panel to abut and form a tight joint in the concrete engaging surface.
4. A concrete wallform section as claimed in Claim 3, wherein said panels include cooperating overlapping flanges as part of said mechanical arrangement and wherein said flanges are in a clear separated position when said hook and slot arrangement are in an angled position and said flanges overlap and abut when said panels are rotated to form the concrete engaging face, and wherein said overlapping flanges are connected to maintain said panels aligned, said flanges cooperating with said panels to form a box-like cell at a junction of said panels.
5. A concrete wallform section as claimed in Claim 4, wherein said panels include intermediate panels, each

intermediate panel includes a hook at one edge thereof and a slot arrangement at the opposite edge thereof and a reinforcing web member extending rearwardly from said concrete engaging surface intermediate said hook and said slot arrangement.

6. A concrete wallform section as claimed in Claim 5, said flanges and said reinforcing web have rear support surfaces at the same spacing from said concrete engaging surface for engaging a strongback.

7. A concrete wallform system comprising a plurality of concrete wallform sections which can be temporarily joined to collectively define a particular concrete form and can thereafter be separated for storage or for reconfiguring to define a different wallform, said plurality of wallform sections including a plurality of straight wallform sections, each straight wallform section including two end wallform panels secured by means of at least one intermediate wallform panel, each of said wallform panels being extruded in a shape to have a planar face with edge profile either side of said planar face which form an overlapping mechanical connection with an adjacent panel, said mechanical connection including first components which engage and overlap adjacent a concrete defining face of said panels and second components significantly spaced rearwardly of said first components and mechanically fastened which also serves to maintain the engagement of said first components.

8. A concrete wallform system as claimed in Claim 7, wherein said first components are pivotally movable from a loose assembly condition where the planar faces of the panels are angled, one to the other, and said first component engage and overlap to a tight final assembly condition where said planar faces lie within a common plane and said second components are mechanically fastened to

maintain said first components in said final assembly condition.

9. A concrete wallform as claimed in claim 8 wherein said first components in said final assembly condition form a tight abutting seam in the common plane whereby the planar faces of adjacent panels merge at the abutting seam which leaves no substantial imprint of the seam in concrete formed by said panels.

10. A concrete wallform system as claimed in Claim 7, wherein a plurality of said straight wallform sections have at least two intermediate panels.

11. A concrete wallform system as claimed in Claim 7, wherein a plurality of said straight wallform sections have at least three intermediate panels.

12. A concrete wallform system as claimed in Claim 7, wherein said straight wallform sections are of widths that differ in width by increments of the width of said intermediate panel.

13. A concrete wallform section comprising a plurality of mechanically connected wallform panels which collectively define a rectangular planar concrete forming surface, said concrete forming surface being collectively defined by planar surfaces of said panels which merge at abutting seams between panels; said panels each cooperating with at least one other panel to define an abutting seam between adjacent planar surfaces of said panels, each abutting seam being defined by a mechanical fastening arrangement between adjacent panels comprising overlapping and engaging first components which initially engage in a loose pivot assembly condition where said planar surfaces of the panels are angled relative to each other and form an accurate abutting seam when said panels are rotated from the assembly

condition to a final condition where the planar surfaces of each panel lie in a common plane with said abutting seam in said common plane, said mechanical fastening arrangement further including second components integral with said panels and spaced rearwardly of said common plane which are fastened one to the other and serve to maintain said seam in said final condition.

14. A concrete wallform section as claimed in claim 13 wherein said wallform panels are each of an extruded section having right and left first and second components at respective side edges of each panel and said components are continuous in the length of said panel.

15. A concrete wallform section as claimed in claim 14 wherein each panel has said first components in an extended portion of said panel and each panel includes a longitudinal reinforcing member on a backside of said panel at an intermediate position in the width of the panel spaced from said extended portion and wherein said first and second components cooperate at the junction between panels to form a longitudinal closed box section reinforcing the abutting seam.

16. A concrete wallform as claimed in claim 13 wherein each abutting seam tightens when under load due to the pressure of the concrete.

17. A concrete wallform as claimed in claim 13 wherein said second components overlap at a position spaced rearwardly of said first components and are held together by a mechanical pin type connection in a position causing a compressive load between said first components at said abutting seam.

18. A concrete wallform as claimed in claim 13 including reinforcing strut type members integral with said panels and

spaced substantial inwardly of side edges of said panels and wherein said strut type members in a surface generally perpendicular to said planar surface are devoid of punched holes.

19. A concrete wallform as claimed in claim 13 wherein said first components cooperate to align edges of panels at abutting seams and draw the edges of adjacent panels into the common plane.

20. A concrete wallform as claimed in claim 19 wherein said first components form a hook and slot connection.

FIG. 1.

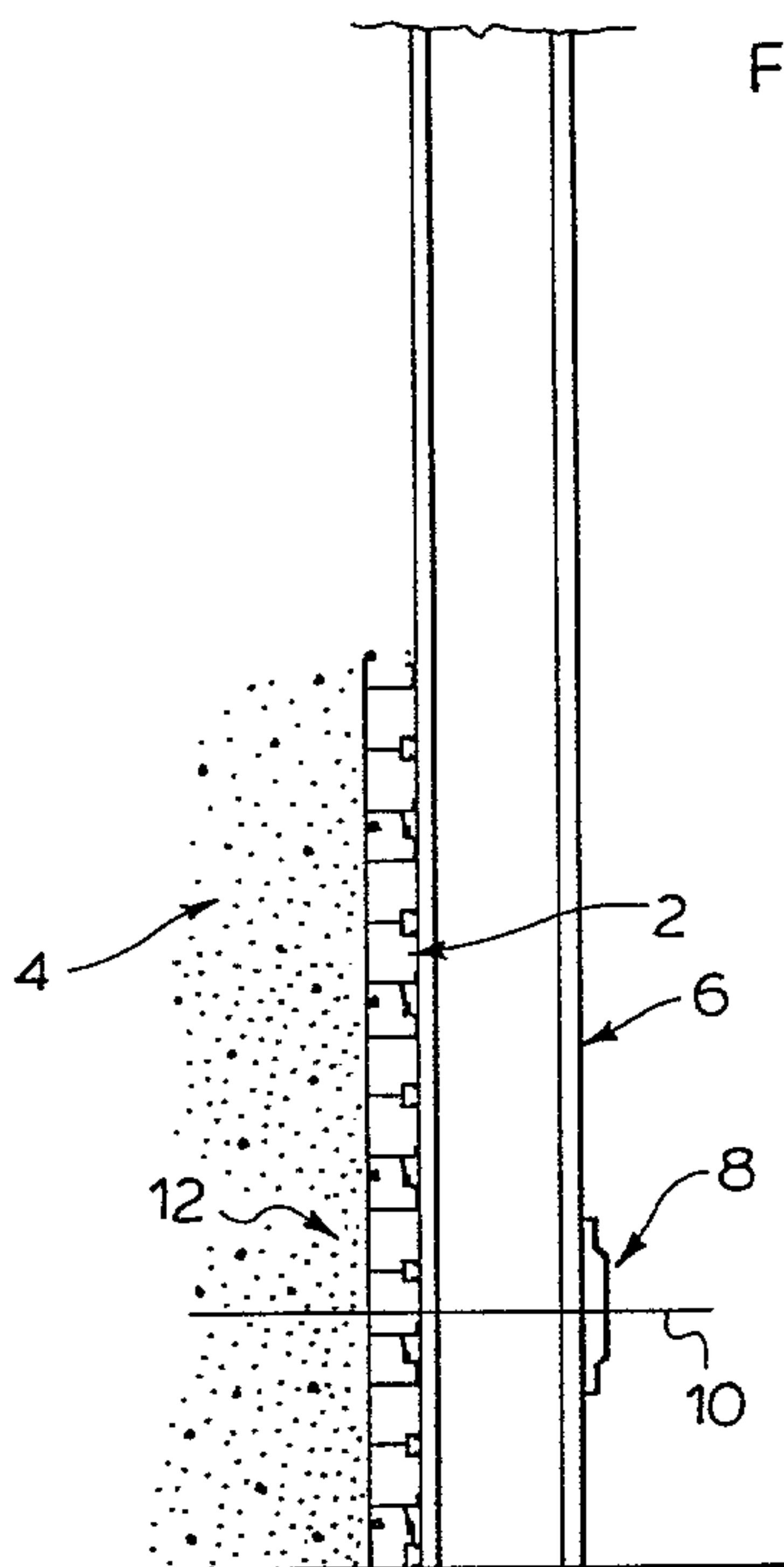


FIG.1a.

