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(54) Improvements in and relating to scaffolding systems.

(57) A scaffolding system of the type comprising interconnected vertical legs (2) and horizontal space frames (4) is described. The legs (2) are provided with socket members (10) and at least one of the chord members of each space frame (4) is provided at either end thereof with first attachment means (20) comprising a pin (28) for insertion into a socket member (10) of a leg to which it is to be attached. The first attachment means (20) additionally include releasable latch means (30) carried on or in the pin (28) and biasing means (36) which, when the pin is inserted into a socket member (10), automatically urges the latch means (30) towards to the locked position. In the locked position a portion of the latch means (30) latches against the socket member (10) to retain the pin (28) therein and movement of the pin (28) within the socket (10) is prevented.

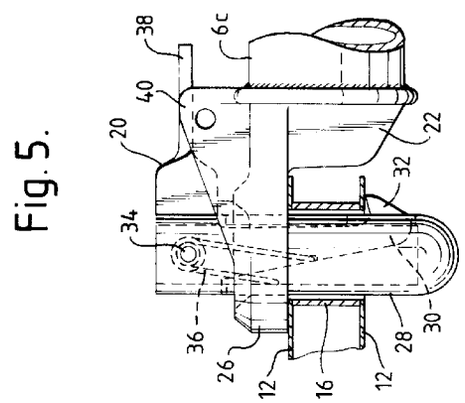

Fig.5.

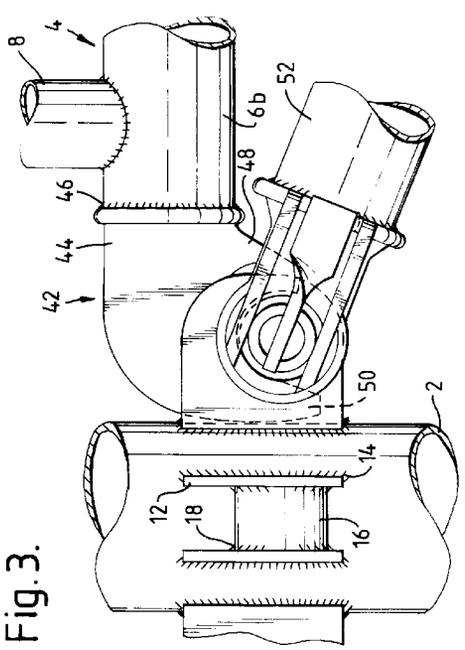

Fig.3.

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This invention relates to scaffolding systems.

Scaffolding systems generally consist of interconnected horizontal and vertical members. The horizontal and vertical members may both be in the same form, e.g. tubular members or the horizontal members can take the form of a space frame comprising two horizontal chord members interconnected and spaced by bracing members.

Scaffolding systems have a multiplicity of uses, a particularly common one of which is to support beams, the beams being used, for example, as a work platform or to support concrete cast thereabove. Scaffolding systems employed for this purpose have to have good structural integrity and a problem which arises with those systems where space frames are employed is how to connect these to the vertical leg members to ensure this.

In one known arrangement, the space frames are connected between adjacent vertical members by inserting pins attached to the ends of the chord members of the space frames in sockets provided on the vertical members. A latch member in the form of a plate pivotally mounted on the space frame is then rotated into a position in which it is held between the bottom edge of the socket and the space frame and so serves to prevent the space frame from upward movement relative the socket which would release the pin therefrom. The latching means plate is carried on a face of the space frame and is, therefore, vulnerable to damage both when the system is being transported in its dismantled state and when it is erected and in use.

The latching plates do not prevent all movement of the pins in the sockets and so do not provide a rigid connection. They are furthermore vulnerable to incorrect positioning on erection and/or dislodgement in use, in which case they will cease to be effective in any way.

Attempts have been made to provide a method of attaching space frames which does not suffer from these disadvantages and which provides a rigid and strong connection between the space frame and the two leg members between which it is secured. For example, British Patent Application 2234776 describes space frames with end vertical members of T-shaped profile which locate in T-shaped slots provided in the leg members, the two then being bolted together. The problem with this is the need for specially shaped parts which adds to the expense of the system. Furthermore, both in this and in other suggested arrangements, bolting is required. This makes erection a laborious and time-consuming operation and the nuts and bolts can be relatively easily lost.

A further disadvantage of all the above-described arrangements is that they do not readily permit the attachment of bracing members across the bays formed by the vertical leg members and the horizontal space frames. Specifically, they do not allow the bracing members to be connected at the points of attachment of the space frames and the vertical leg members. The addition of bracing members at locations off-set from these attachment points can cause the introduction of secondary stresses into the system.

In accordance with the invention a scaffolding system has a plurality of vertical legs, each provided with socket members along the length thereof, and a plurality of space frames, each of which comprises two horizontal chord members interconnected and spaced by bracing members and first attachment means at either end of at least one of the chord members whereby the space frame may be connected between two adjacent vertical legs, the first attachment means comprising a pin for insertion into a socket member, releasable latch means carried on or in the pin and biasing means which, when the pin is inserted into a socket member, automatically urges the latch means towards a locked position in which a portion thereof latches against the socket member to retain the pin therein and movement of the pin within the socket is prevented.

The advantages of this arrangement are that, firstly, the first attachment means are automatically operated so that erection of the system is simpler and quicker. Secondly, they do not require any bolts nor indeed any separate parts which could easily be lost. Thirdly, a rigid and secure connection is provided in which movement of the pin within the socket is prevented and so too, therefore, is movement of the space frame relative the vertical leg to which it is connected. Furthermore, as the latch means is carried on or in the pin, it can be located so that, in use, it is positioned between the vertical member and the space frame and is, therefore, protected.

Very preferably the latch means is carried in the pin with the portion thereof which latches against the socket protruding from the pin. The risk of damage to the attachment means, not only when a scaffolding system is erected and in use but also when it is dismantled and being transported, is, therefore, minimized.

Suitably the biassing means comprises a spring carried in the pin.

The pin is preferably dimensioned such that it will form a close fit with the socket member to thereby provide a rigid and strong connection of the space frame and vertical member.

The other chord member of each space frame may also be provided at each end thereof with first attachment means. However, preferably, the other chord member of each space frame is provided at either end thereof with second attachment means comprising a C-shaped end fitting which locates around and cooperates with a portion of a socket member. It has been found that, so long as one of the chord members of each space frame is provided at each end thereof with the first, pin, attachment

means, sufficient system stability results from the use of the second, simpler, attachment means at the other chord. The result is a very economical system which is easy to erect and dismantle. A further advantage is that, as will be further described below, the C-shaped end fitting when located around and cooperating with a particular socket member does not interfere with or prevent the securement of a first attachment means to that socket member. Diagonal bracing members provided at an end thereof with a first attachment means can, therefore, be secured to the socket member. In this way the introduction of secondary stresses into the system is avoided.

The socket members are suitably arranged in spaced groups, each group comprising two sets of four socket members equi-angularly spaced around a vertical leg, the sets being spaced apart by a distance approximately equal to that between the chord members of a space frame.

In a preferred embodiment each socket member comprises a pair of spaced plates, each connected at one end to a vertical leg and formed with an aperture therein dimensioned such that a pin of the first attachment means may be passed therethrough, the apertures being aligned. A ring is secured between the plates with its axis aligned with the apertures therein. The outer radius of the ring is approximately equal to the radius of the inner face of a C-shaped end fitting of the second attachment means. The distance between the ring and the vertical leg to which the socket member is secured is equal to the width of an arm of the C-shaped end fitting. The result is that axial movement of a chord member of a space frame provided with the second attachment means relative the vertical legs between which it is connected is prevented. By also making the spacing between the plates of a socket member approximately equal to the thickness of an arm of the C-shaped end fitting, movement of the chord in the horizontal plane is prevented.

The invention will now be further described by way of example with reference to the accompanying drawing in which:-

Figure 1 is a side view of part of a scaffolding system in accordance with the invention;

Figure 2 is a plan view of the scaffolding system part of Figure 1;

Figure 3 is a side view of another part of the scaffolding system of Figure 1;

Figure 4 is a side view of a leg of the scaffolding system of Figure 1; and

Figure 5 is a side view of a first attachment means of the scaffolding system of Figure 1 which illustrates the operation thereof.

The scaffolding system comprises a plurality of vertical legs 2 interconnected by space frames 4. The space frames 4 comprise two horizontal chord members 6 interconnected and spaced by bracing members 8 which may be vertical, as shown, and/or diagonal.

The legs 2 are provided with a plurality of groups of sockets 10 along their length, each group consisting of two sets of four equi-angularly spaced sockets 10. The spacing between each set of sockets 10 is approximately equal to that between the two chord members 6 of the space frames 4. The number of groups of sockets 10 provided will obviously depend on the length of the leg 2. As illustrated in Figure 4, only one group of sockets 10 may be provided.

Each socket 10 consists of a pair of plates 12 welded, see 14, to the leg 2. Aligned apertures 15 are provided in the plates 12 and a ring 16 whose inner diameter is equal to that of the apertures is welded, see 18, between the plates 12 with its axis aligned with those of the apertures 15. The set of sockets 10 which are uppermost has the apertures 15 in the upper halves of the plates 12, whilst the set which is lowermost has the apertures 15 in the lower halves of the plates 12.

Figure 1 shows the top chord 6a of a space frame 4. This is provided at either end with first attachment means 20 shown in detail in Figure 5. The first attachment means 20 comprises a body having a generally annular boss 22 by which it is welded, see 24, to the end of the chord member 6a. An integral bracket portion 26 of the boss 22 mounts a hollow pin 28 which extends transversely to the plane of the space frame 4. A hook-like latch member 30 is mounted in the interior of the pin 28. The latch member 30 has a hooked projecting nib 32 which protrudes through a slot provided in the wall of the pin 28.

The other end of the latch member 30 is pivotally mounted on, for example, a Bissel pin 34 connected between opposite walls of the pin 28. A torsion spring 36 is mounted between an internal surface of the pin 28 and the latch member 30 and around the pivot pin 34. The torsion spring 36 urges the latch member 30 to the position illustrated in Figure 5 in which the nib 32 projects from the pin 28.

Adjacent the pivot pin 34, the latch member 20 has an integral operating arm 38 which projects laterally from the pin 28 through a slot in the wall of the latter as shown in Figure 1. The operating arm projects towards the chord member 6a of the bracing frame 4 and is disposed between a pair of protective ribs or flanges 40 on the latching member 20.

When the pin 28 of the latching member 20 is inserted through apertures 15 and ring 16 of a socket member 10, the nib 32 is pushed into the pin 28 against the bias of spring 36, the nib 32 being provided with a tapered leading surface to facilitate this movement. When the pin 28 has been fully inserted, the spring 36 will cause the nib 32 to revert to the position in which it projects through the slot in the pin 28 so causing it to engage the plate 12 on the opposite side of the socket member 10 to that from which the pin 28 was inserted. The pin 28 will, therefore, be posi-

tively retained within the socket member 10.

Furthermore, as illustrated in Figure 5, the pin 28 is a close fit within the ring 16, whilst the distance between the bracket 26 and the tip of the nib 32 is equal to that between the two plates 12 of the socket member 10. Thus a rigid connection will be provided at which there will be little movement of the parts.

To release the space frame 4, the arm 38 is pressed towards the chord 6a to cause the nib 32 to be withdrawn into the pin 28 against the bias of the spring 36. Pin 28 can then be withdrawn from the ring 16.

Figure 3 shows the lower chord 6b of a space frame 4. This is provided with second attachment means 42 at either end thereof. The attachment means 42 comprises an annular boss 44 by which it is welded, see 46, to the end of the chord member 6b. Integrally formed with the annular boss 44 is a C-shaped end fitting 48 with an inner circular face of the same radius as the exterior of ring 16. The width of the outer arm 50 of the C-shaped end fitting 48 is equal to the distance between the ring 16 of the socket member 10 and the face of the leg 2 to which the socket member 10 is attached. The thickness of the C-shaped end fitting is equal to the distance between the plates 12 of the socket member 10. The result of this is that the C-shaped end fitting 48 will locate around the ring 16 with its far arm 50 held in the plane transverse to the axis of the leg 2 by the plates 12, the ring 16 and the leg 2. The prevents any movement of the end fitting 48 within this plane and thus provides a secure and rigid connection between the lower chord 6b and the leg 2.

The form of the socket members 10 and of the second attachments means 42 allows a bracing member 52 to be additionally attached between the point of connection of a leg 2 and the lower chord 6b of a space frame 4 and a head or base jack carried on an adjacent leg. The diagonal bracing member 52 is provided at one end thereof with a first attachment means 20. The pin thereof can be inserted through the ring 16 without interference from the end fitting 48 of the second attachment means 42 provided at the ends of the lower chord 6b of the space frame 4. By attaching the diagonal bracing member 52 at the point of connection of the space frame 4 and vertical leg 2, the introduction of secondary stresses into the system is avoided.

The space frame 4 can be easily and securely attached between two vertical legs 2 by pinning its upper chord 6a to two aligned socket members 10 with the first attachment means 20, and latching its lower chord 6b between two further aligned socket members 10 by locating the end fittings 48 of the second attachment means provided at either end thereof around the rings 16 of the socket members 10. It will be appreciated that the opposite arrangement could be employed, that is, first attachment means could be provided at either end of the lower chord 6b with second attachment means being provided at either end of the upper chord 6a. Diagonal bracing members 52 can be attached at those socket members where a space frame chord is connected by second attachment means. Furthermore, the diagonal bracing members could instead be provided with a suitable form of the second attachment means so that these could be attached at socket members where a space frame chord is secured by first attachment means.

Claims

1. A scaffolding system having a plurality of vertical legs, each provided with socket members along the length thereof, and a plurality of space frames, each of which comprises two horizontal chord members interconnected and spaced by bracing members and first attachment means at either end of at least one of the chord members whereby the space frame may be connected between two adjacent vertical legs, the first attachment means comprising a pin for insertion into a socket member, releasable latch means carried on or in the pin and vicing means which, when the pin is inserted into a socket member, automatically urges the latch means towards a locked position in which a portion thereof latches against the socket member to retain the pin therein and movement of the pin within the socket is prevented.

2. A scaffolding system as claimed in Claim 1 wherein first attachment means are also provided at each end of the other chord member of each space frame.

3. A scaffolding system as claimed in Claim 1 wherein the other chord member of each space frame is provided at either end thereof with second attachment means comprising a C-shaped end fitting which locates around and cooperates with a portion of a socket member.

4. A scaffolding system as claimed in any preceding Claim wherein the socket members of each vertical leg are arranged in spaced groups, each group comprising two sets of four socket members equi-angularly spaced around the leg, the sets being spaced apart by a distance approximately equal to that between the chord members of a space frame.

5. A scaffolding system as claimed in any preceding Claim wherein each socket member comprises a pair of spaced plates, each connected at one end to a vertical leg and being formed with an aperture

therein dimensioned such that a pin of the first attachment means may be passed therethrough, the apertures being aligned.

6. A scaffolding system as claimed in Claim 5 as dependent on either Claim 3 or Claim 4 wherein the distance between the plates is equal to the thickness of at least the arms of the C-shaped end fitting.

7. A scaffolding system as claimed in Claim 5 or Claim 6 wherein each socket member further includes a ring secured between the plates with its axis aligned with that of the apertures therein.

8. A scaffolding system as claimed in Claim 6 or Claim 7 as dependent on either Claim 3 or Claim 4 wherein the C-shaped end fitting has a part circular inner face, the radius of which is equal to the outer radius of the ring.

9. A scaffolding system as claimed in either Claim 6 or 8 or Claim 7 when dependent on either Claim 3 or Claim 4 wherein the ring is carried by the plates at a distance from the vertical leg to which these are secured equal to the width of an arm of the C-shaped end fitting.

10. A scaffolding system as claimed in any one of Claims 3 to 9 including bracing members provided at one end thereof with second attachment means.

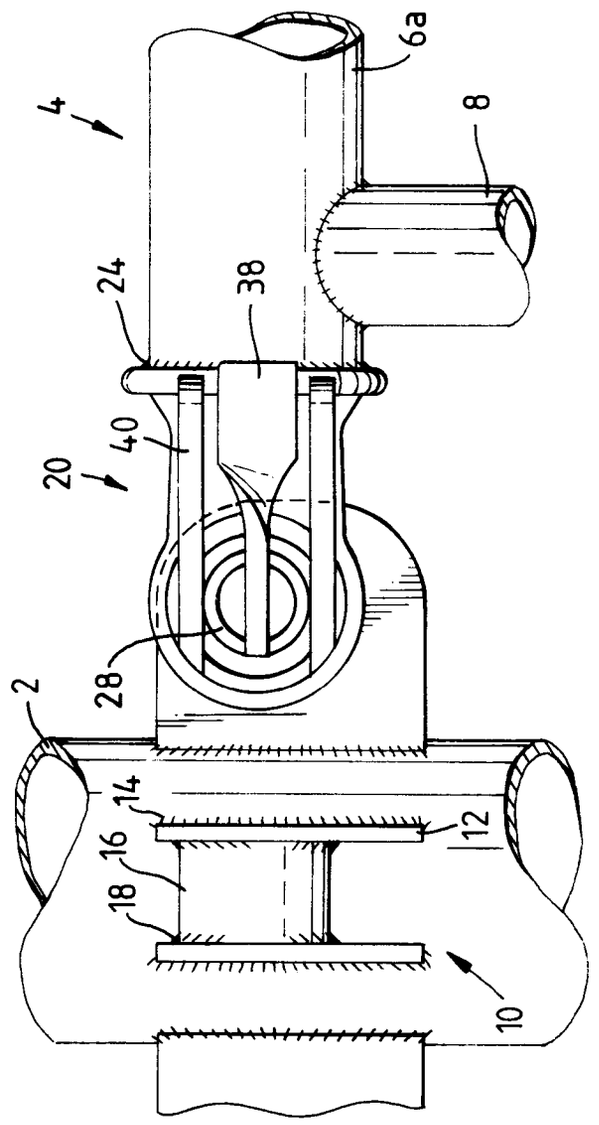
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Fig.1.

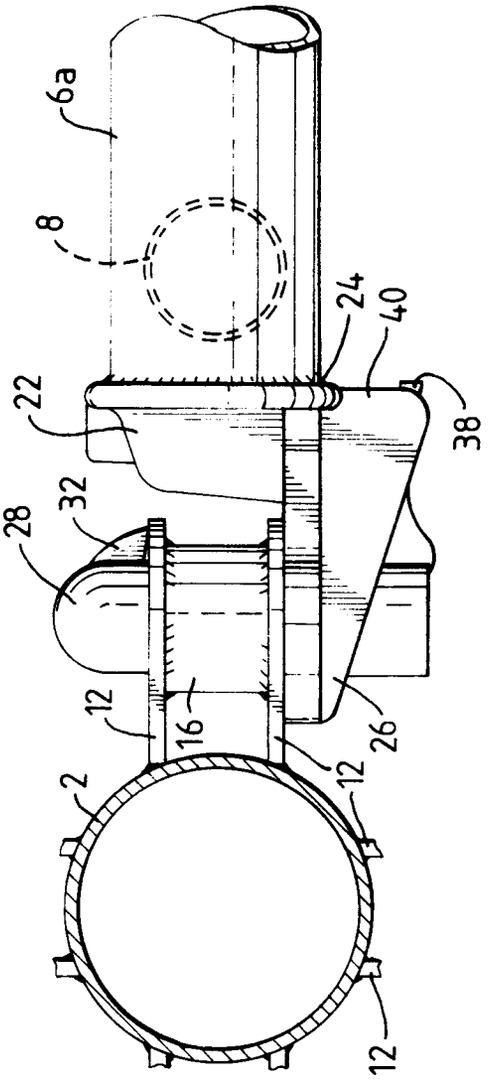
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Fig.2.

Fig.5.

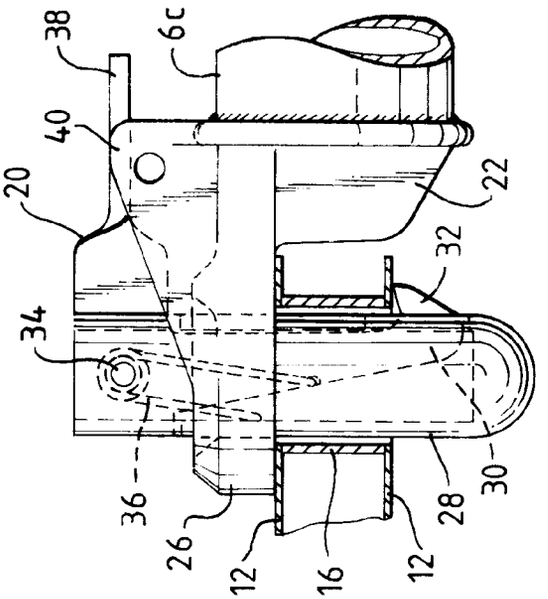


Fig.3.

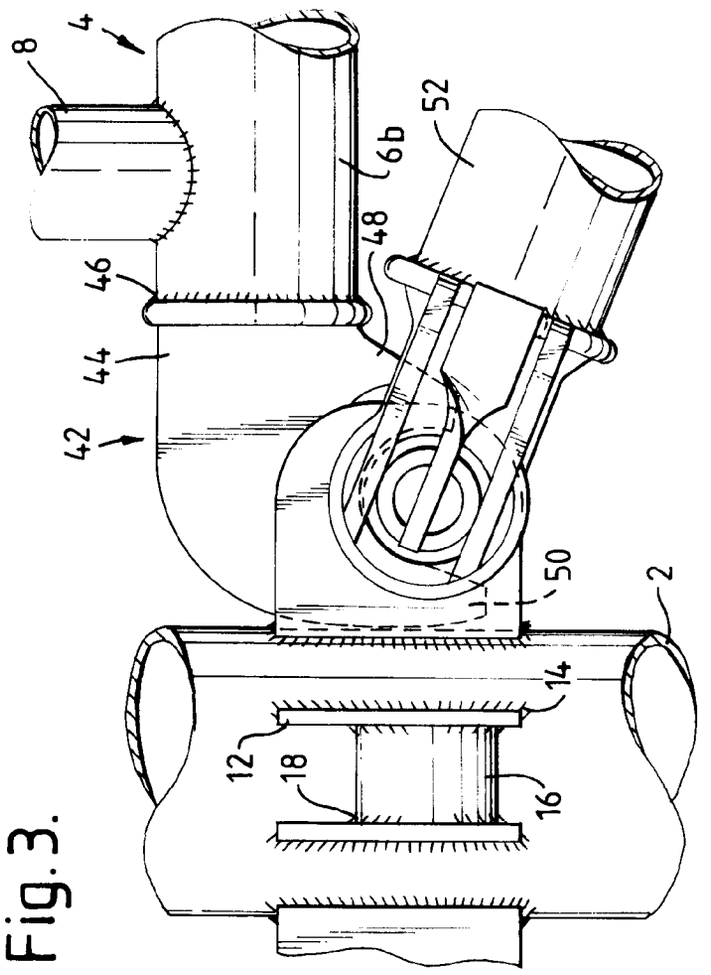
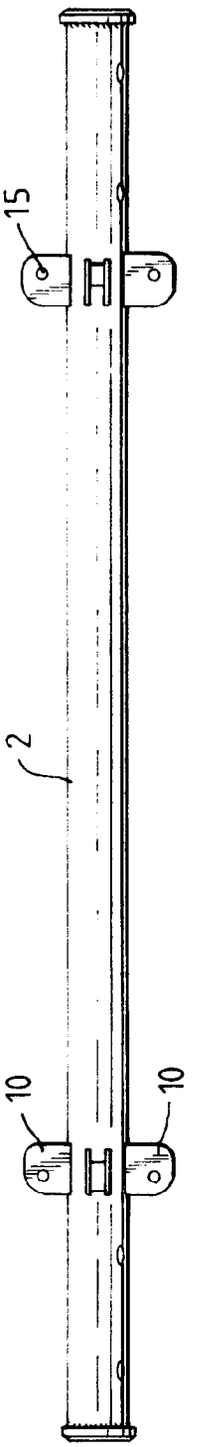


Fig.4.



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EUROPEAN SEARCH REPORT

Application Number

EP 91 31 1365

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-0 014 623 (SOMEFRAN)	1,2,10	E04G7/30
A	* page 4, line 21 - page 11; figures *	4	E04G1/26
	---		E04G1/16
Y	GB-A-1 471 356 (PALMERS SCAFFOLDING LTD)	1,2,10	
	* page 1, line 45 - line 86; figures *		

Y	FR-A-2 533 610 (SOMFRAN)	1,2	
A	* page 3, line 24 - page 6; figures *	3	

P,X	EP-A-0 427 448 (GRAYSTON CENTRAL SERVICES)	1	
	* the whole document *		

A	WO-A-8 803 212 (LUBECA CON.)		

A	FR-A-1 348 548 (F.A.P.)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
E04G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 MARCH 1992	VIJVERMAN W.C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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