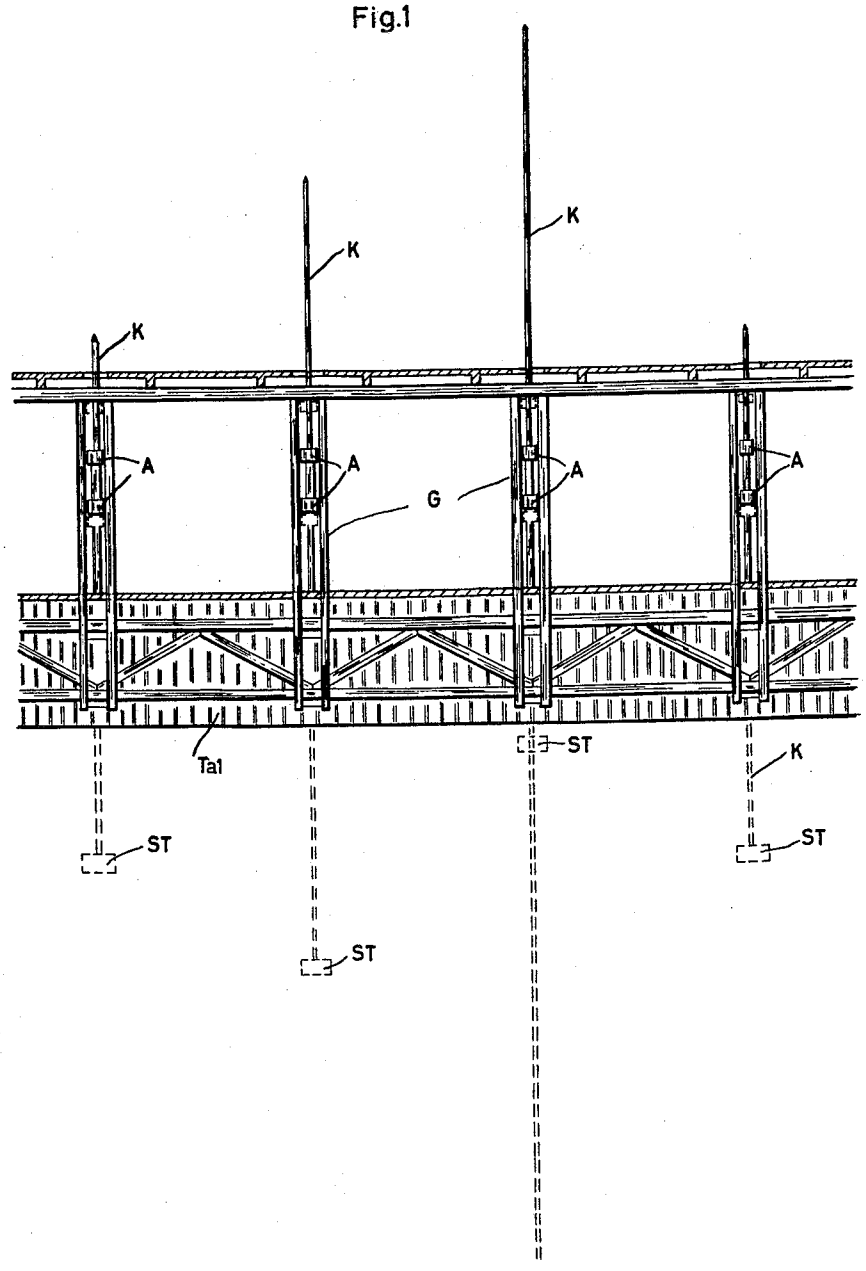
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SLIP-FORM JACK

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Fig.1

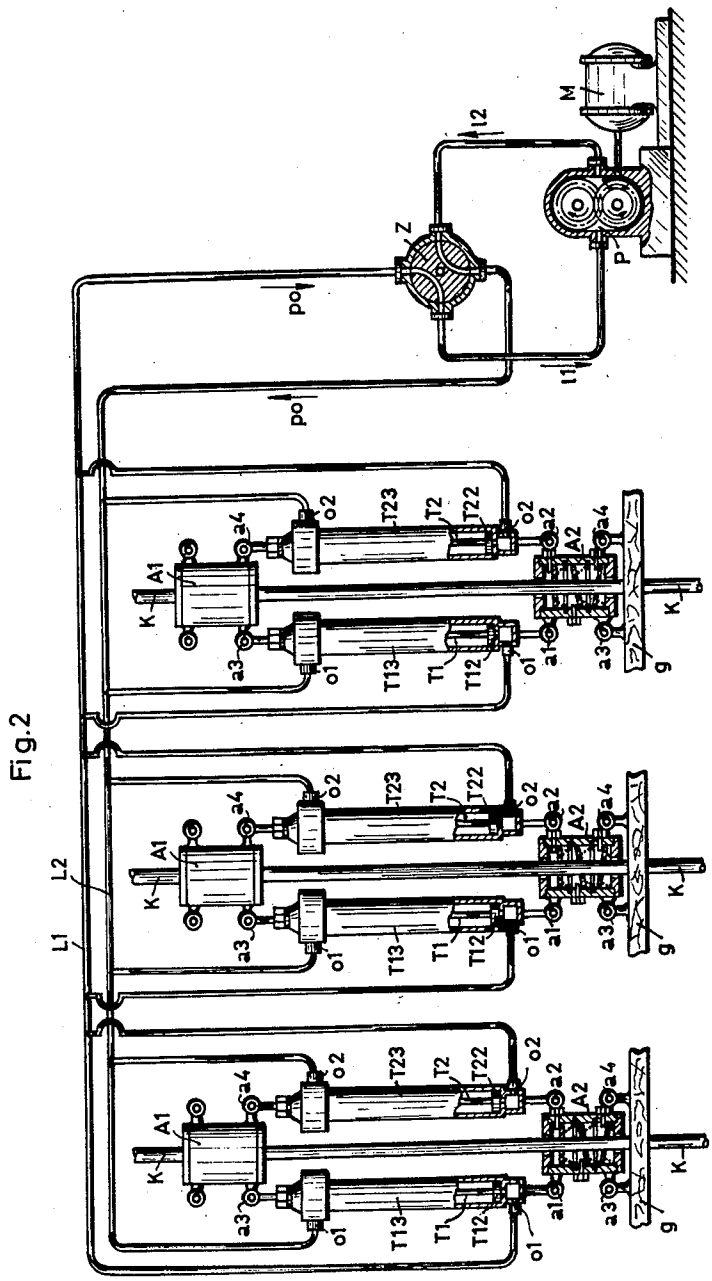


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Fig.2



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Fig.3

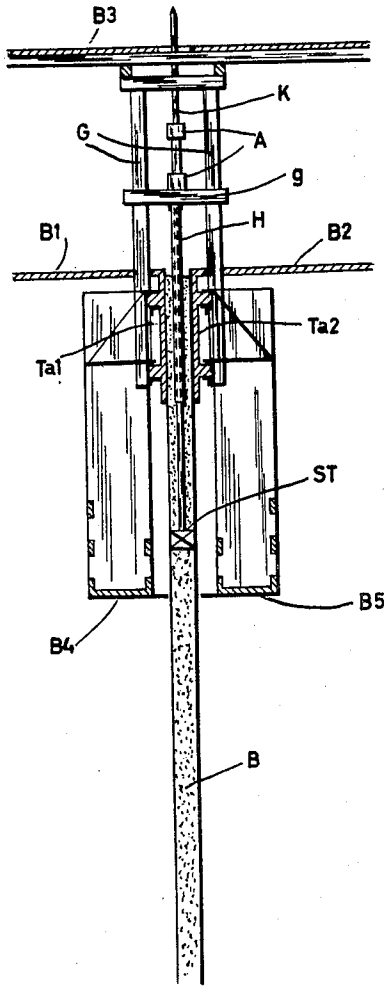


Fig.4

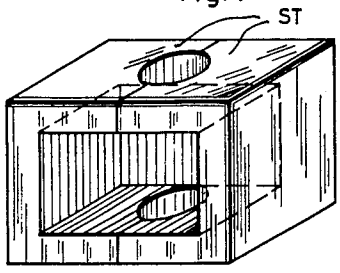


Fig.5

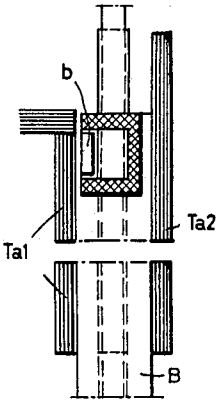


Fig.6

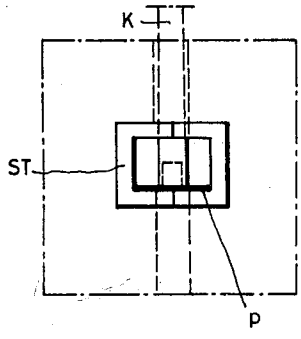
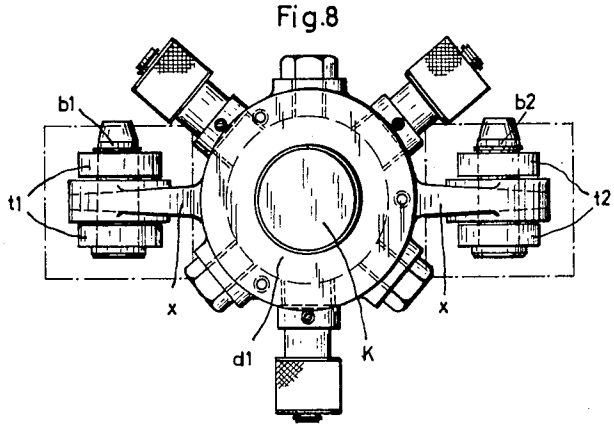


Fig.8

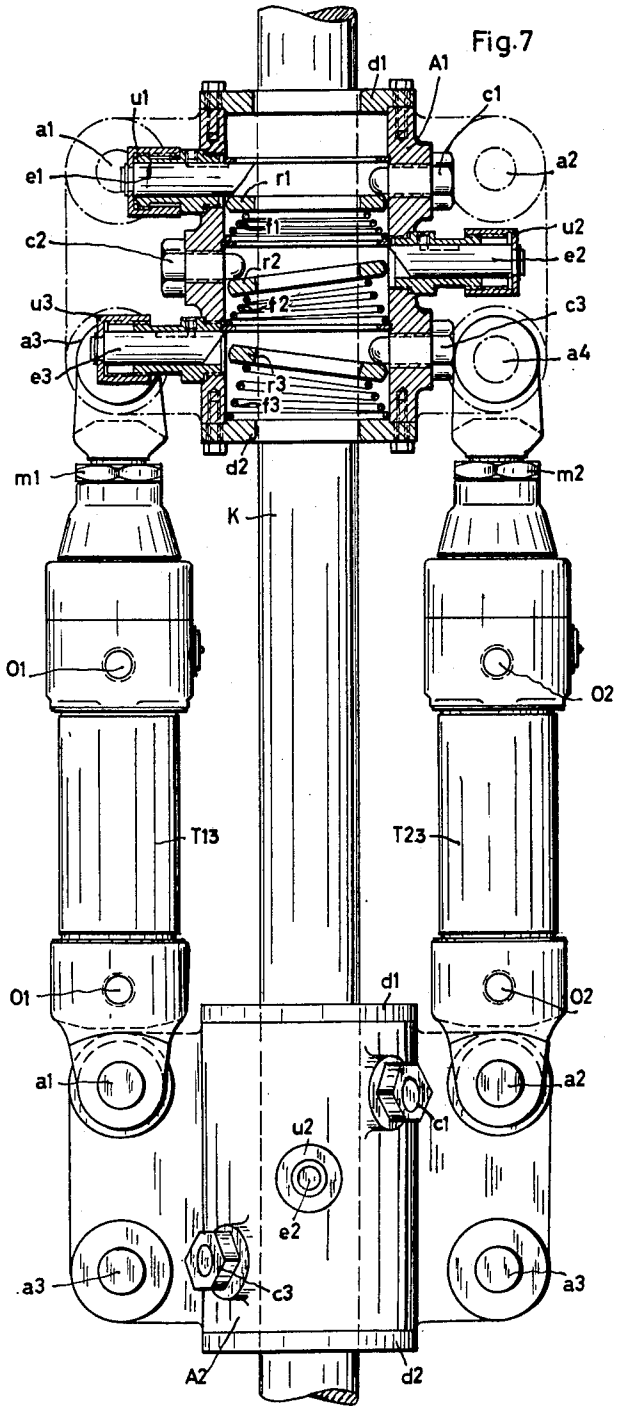


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Fig.7



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SLIP-FORM JACK

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Claims priority, application Germany June 13, 1958
2 Claims. (Cl. 254—106)

This invention is concerned with adjustable scaffolding for concrete constructions, a so-called sliding-panel scaffolding, which is particularly advantageously used in erecting concrete constructions having high and smooth walls, such scaffolding having forming panels between which the concrete is to be poured, and such forming panels, together with associated work stages or platforms being according to the progress of a construction upwardly displaceable along principal upright carriers which are anchored in or upon previously completed sections of the concrete wall to be constructed.

The arrangement of the upright carriers within the concrete wall to be built presents certain advantages so far as the construction of the sliding forming panels is concerned, but renders difficult the recovery of the carriers which lie in the concrete. The carriers which are placed in successively higher positions as the concreting progresses, may be in known manner provided with bushing-like sleeves which are raised along the carriers together with the forming panels and prevent the embedding of the carriers. The number of carriers, consisting of round or of tubular steel members, to be kept available at a construction site, must be sufficient for the entire height of the structure to be built. Considerable amounts of steel are required since the walls must be provided with the vertically extending principal carriers at spacings from two to three meters, and full recovery of the carriers is accordingly of great economic value. Experience teaches that a considerable percentage of the carriers extending within the concrete wall to the ground cannot be removed after completion of the wall, owing to excessive frictional resistance and the like, so that they must be abandoned as lost.

The invention shows a way pointing to relatively effortless recovery, with more chances of success, of the carriers which are vertically upwardly placed within cylindrical cavities of the concrete wall.

In accordance with the invention, this object is realized, by raising or hoisting the carriers in sections, in the course of the progress of the work, and placing them upon supports, for example, steel plates, which are from the outside insertible through openings formed in the concrete wall to be built and extend into the areas of the cavities provided for the carriers.

The above indicated procedure reduces the number of upright carriers to be kept available, requiring carriers for only a fraction of the final height of the construction, and moreover calling for removal of carriers from only the final ten to fifteen meters of the topmost wall portion, such removal being relatively easily accomplished, so that as a rule all carriers can be recovered.

It is recommended to employ tubular carriers with a diameter corresponding to the required breaking stress. Such tubular carriers are of importance particularly in connection with mechanical raising or hoisting devices in which the entire slide panel assembly is suspended from clamping rings, the inner diameter of which exceeds that of the carriers, and which are eccentrically loaded so that they wedge in clamping engagement with the carriers.

Further details of the invention will appear from the

description of an embodiment which will be rendered below with reference to the accompanying drawings. In the drawings,

FIG. 1 is a front view of the essential parts of the slide panel scaffolding extending over the range of four carrier or hoisting lines;

FIG. 2 is a side view of a plurality of telescoping hoisting devices and hydraulic system therefor, with portions of the respective structures illustrated in section;

FIG. 3 shows a side view of the structure;

FIG. 4 illustrates a two-part guide or positioning block to be inserted into the wall for the support of an upright carrier;

FIG. 5 represents a section through the upper part of the concrete wall with a guide block inserted therein;

FIG. 6 shows a front view of a guide block with the lower end of an upright carrier supported upon a plate inserted in the guide block;

FIG. 7 is a part sectional side view of the raising or hoisting and clamping device associated with an upright carrier; and

FIG. 8 shows a top view of the structure according to FIG. 7.

Referring now to FIGS. 1 and 3, B is the concrete wall to be built, having guide or positioning blocks ST inserted therein. The upright carriers K are pipes with relatively small diameter, extending through cylindrical cavities of the concrete wall, and respectively supported each by a plate *p* disposed in the corresponding positioning block ST (FIG. 6), the carriers projecting more or less beyond the upper end of the wall. As seen from FIG. 3, the lower work platforms B1 and B2, with the forming panels Ta1 and Ta2, and the upper work platform B3, which is connected therewith through the medium of a schematically indicated twin-head structure G, are suspended from the upright carriers K by means of the schematically indicated suspension or hoisting device A.

The suspension or hoisting device A, as will be presently explained with reference to FIGS. 7 and 8, is provided with a plurality of clamping rings surrounding the corresponding upright carrier, and embracing the carrier incident to the lifting or hoisting operation, the uppermost clamping ring clamping first about the carrier and, by means of a hydraulically controlled telescope-bar drive, causing displacement of the lower clamping ring from which depends the slide-panel structure; the lower clamping ring thereupon clamping fast about the carrier whereupon the telescope-bar drive is operated in spreading sense, thereby moving the upper clamping ring upwardly, such ring again clamping about the carrier, thus effecting the raising of the slide-panel assembly. The hydraulically controlled hoisting devices, which are required for the respective upright carriers, are simultaneously switched in over the entire extent of the wall, thus operating mutually in parallel and thereby raising the slide-panel assembly, for example, always by five to eight centimeters. The concrete is thereupon poured, and further upward sliding is effected only after the upper end of the poured concrete has sufficiently set (hardened). The previously mentioned sleeves, such as the sleeve H (FIG. 3), are respectively fastened to the lower transverse bar of the corresponding twin-head device G, such sleeve surrounding the corresponding upright carrier K within the portion of the upper wall in which the concrete has not yet set. The sleeve can upon raising of the slide-panel assembly easily slide free of the concrete, leaving sufficiently free play between the carrier and the concrete surrounding it, so that the carrier can subsequently be pulled therefrom.

For this purpose, as shown in FIGS. 1–3, guide or positioning blocks ST, illustrated in FIG. 4, are inserted

in the concrete wall, spaced from one another by the length of one or more upright carriers (always from six to eight meters long).

The guide or positioning block consists of two similarly shaped complementary halves, forming a unit having at the top and at the bottom cylindrical openings approximated to the diameter of the protecting sleeve and being opened toward the front (FIG. 6) or wall side. Into this block is subsequently inserted an iron plate *p* to serve as a support for an upright carrier K, as indicated in FIG. 6.

Entry of concrete into the interior of the guide block must be prevented during the concreting; as shown in FIG. 5, the rectangular opening in the guide block is for this purpose closed by a small board *b*.

While the carrier as well as the tubular protecting sleeve surrounding it pass upon raising through the guide block ST, the sleeve moves during further raising out of the block ST. The slide panel assembly reaches upon further raising the position in which it is shown in FIG. 3. The clamping action of the clamping device A is during a pause in the raising operation temporarily disabled, thus relieving the respective carriers for upward motion thereof by operations conducted from the work platform B3; the respective upper carriers are thereupon removed while the lower carriers K are left in the concrete wall to stand respectively upon plates *p* which are inserted into the corresponding guide blocks.

In FIG. 3 is indicated downwardly extending suspension parts having auxiliary work platforms B4 and B5 which are suitably fastened to the head structure G, such platforms serving as stages for the insertion of the guide blocks ST. The channels or cavities extending in the concrete wall downwardly, from which the uprights had been removed, can thereby be filled with concrete; the lateral openings of the respective guide blocks (shown in FIG. 5 as closed by means of a board) can also be closed by operations from the auxiliary platforms B4 or B5 either by inserting mortar or by the use of suitable closure members. The supporting plates (*p* in FIG. 6) can moreover be removed after upward displacement of the corresponding uprights, and such plates can be used again for insertion into the successively higher guide blocks.

The upward drawing of the individual carrier sections is effected during the pauses in which there is no sliding displacement of the forming panels, relieving the corresponding raising position temporarily of the load, the weight of the resting forming panel assembly, including work load, being temporarily absorbed by friction of the forming panels as well as by incompleted neighboring upright carrier lines. Accordingly, the upright carriers of all positions are not drawn upwardly simultaneously or directly successively, but in the course of the work only in connection with a certain number of carrier lines, always during the pauses between sliding displacement of the forming panels, so that the labor force required therefor can be continuously occupied while the sliding and panel-positioning operations do not suffer any delays.

As may be recognized from the schematic representation in FIG. 3, the suspension device A comprises two clamping heads which embrace the upright carrier tube or pipe K. These clamping heads are interconnected by means of a telescope-rod drive operated by a pressure medium, for example, water under pressure. The upper part A1 of the suspension device (A in FIG. 3) and cooperating telescope-rods is illustrated in FIG. 7, the lower part A2, shown in FIG. 2, being constructed similarly.

The part A1 consists essentially of a cylindrical bushing provided with covers *d*1 and *d*2 connected thereto by screws, the carrier pipe K passing therethrough with slight play. From the bushing A1 extend carrier arms having upper fastening eyelets *a*1—*a*2 and lower fastening eyelets *a*3—*a*4, respectively. The lower fastening eyelets *a*3—*a*4 are engaged by forked ends *t*1—*t*2 of the telescope-rods T1 and T2, bolts *b*1 and *b*2 extending through holes in the forked ends *a*3 and *a*4 and through the eyelets, respectively, such bolts being suitably secured against inadvertent or accidental disengagement. Each telescope-rod consists in known manner of two mutually telescoping parts operating in the manner of a cylinder T13 or T23 and a cooperating piston T12 or T22, one of the parts, for example the pistons T12 and T22 being in the illustrated manner connected with the respective eyelets *a*3 and *a*4 of the upper clamping head A1 and the other parts, for example the cylinders T13 and T23, of the telescope-rods T1 and T2 being connected with eyelets of the lower clamping heads A2, illustrated in FIG. 2, corresponding to the upper eyelets *a*1—*a*2 of the upper clamping head shown in FIG. 7. To the lower eyelets such as *a*3, *a*4, of each lower clamping head is in suitable manner connected the transverse bar *g* shown in FIG. 3; the lower eyelets of the lower clamping head thus carrying the entire slide panel assembly. The hydraulic liquid, for example, water under pressure, is conducted to the upper (and lower) ends of the telescope-rod drive through hose means connected with openings such as O1 and O2.

In the upper bushing A1 (and similarly also in the corresponding lower bushing) are disposed three clamping rings *r*1, *r*2, *r*3, which are respectively pressed upwardly by cooperating conical springs *f*1, *f*2, *f*3. The rings *r*1 to *r*3 lie respectively in engagement with the inner ends of stub screws *c*1, *c*2, *c*3, and, as shown in connection with the ring *r*1, can be pressed downwardly against the force of the corresponding springs *f*1, *f*2, *f*3, by means of associated bolts or pegs *e*1, *e*2, *e*3 adapted to be displaced radially by means of sleeve nuts *u*1, *u*2, *u*3 respectively cooperating therewith. The ends of bolts or pegs *e*1, *e*2, *e*3 are for this purpose formed oblique so that the rims of the associated rings *r*1, *r*2, *r*3 can downwardly slide thereon. In case all three bolts *e*1, *e*2, *e*3 are moved radially inwardly into the position in which bolt *e*1 is illustrated, all three rings *r*1, *r*2, *r*3 will be disengaged or decoupled from the upright carrier K, so that the bushing A1 can move in both directions freely with respect to the carrier. However, the clamping rings are normally in the positions illustrated in connection with rings *r*2 and *r*3.

After the concrete has been poured up to the upper rim of the forming panels (FIG. 1) such panels or boards T*a*1 and T*a*2 are together with the entire forming assembly pulled a few feet higher. Water under pressure is for this purpose pumped from a centrally located pump P, actuated by suitable means such as a motor M, as illustrated in FIG. 2, and over suitable lines *po* into the openings O1 and O2 (FIG. 7) of the telescope-rod drives of all suspension devices A of FIG. 1. The telescope-rod drives are thereby shortened, whereby the bushing A1 (FIG. 7) attaches itself with its two clamping rings *r*2 and *r*3 to the upright carrier K, thus causing the rods T1 and T2 to raise the lower clamping head A2 together with the forming panel assembly fastened thereto, by an amount corresponding to the stroke of the telescope-rod drive. In order to avoid undesired strokes of different length, due to different loading of the individual raising devices, which would bring the scaffolding into an oblique position, it is necessary that the individual telescope-rod drives be supplied with pressure liquid, until each engages an associated stop at the instant when the entire stroke has been completed. However, in order to permit raising of the forming panels by different amounts, at the supporting points therefor, so as to correct errors with respect to the horizontal position thereof, there are provided at the rod drives T1 and T2, adjusting nuts *m*1 and *m*2, whereby the stroke of each hoisting device can be adjusted independently of the others since the stroke length or height of the respective rods is changed thereby. The nuts *m*1 and *m*2 can be actuated by utilizing a thread

cut on the telescoping rods of the rod drives T1 and T2 so that the telescope rods, while always returning fully can be operatively actuated only to the stop of the respective adjusting nuts *m*1 and *m*2. It is understood, of course, that both adjusting nuts must be uniformly set. Upon subsequent cessation of the hydraulic pressure in the hoisting devices, the telescope-rod drives will cease to hold the slide-panel assemblies in equilibrium the clamping rings of the lower bushing A2, as shown in FIG. 2 taking the load, while the clamping rings of the upper bushing A1 (FIG. 7) are relieved of the load.

The telescope-rods can thereafter be extended again over the entire length of the stroke, either by strong springs or by hydraulic pressure at the other end of the pistons thereof under control of the two-way valve Z, thereby effecting raising of the upper carrier elements, that is, the bushings such as A1 with the corresponding clamping rings *r*1 to *r*3 which do not hinder the upward motion of the corresponding bushings A1.

The successively effected operations, namely, the clamping fast of the clamping rings *r*1 to *r*3 of the upper bushing A1; the raising of the slide-panel assembly on this bushing A1 owing to shortening or contraction of the telescope-rod drives T1 and T2 responsive to inward displacement of the drives; the subsequent clamping of the clamping rings in the lower bushing, which take over the entire load; and finally the re-extension of the telescope-rod drives T1 and T2 and therewith raising of the bushing A1, effect stepwise raising of the entire slide-panel assembly along the principal upright carriers.

Changes may be made within the scope and spirit of the appended claims which define what is believed to be new and desired to have protected by Letters Patent.

We claim:

1. Motor driven hoisting apparatus for use in constructing a concrete wall and the like, progressively upwardly in generally vertically extending sections, said hoisting apparatus being cooperatively associated with a vertically extending carrier rod adapted to be anchored in and extending upwardly from a completed wall section, for raising scaffolding along such carrier rod to a level from which the next wall section is to be constructed, said hoisting apparatus comprising two vertically spaced apart rod-gripping devices each having a tubular generally cylindrical casing concentrically surrounding said carrier rod with play and forming a radial space therewith, at least two vertically extending fluid pressure controlled raising devices symmetrically disposed with respect to and radially spaced from said carrier rod, each raising device having a telescoping drive comprising a cylinder and a piston movably disposed therein, means for articulately linking the pistons of said raising devices with the casing of one of said rod-gripping devices and means for articulately linking the cylinders of said raising devices with the casing of the other one of said rod-gripping devices, means for alternately selectively conveying pressure fluid respectively to the top and bottom of the cylinders of the respective raising devices to effect the raising operation thereof, and means in the respective rod-gripping devices operatively responsive to the raising operation of said raising devices for causing the casing of the upper rod-gripping device to anchor itself to the carrier rod while the lower rod-gripping device slides upwardly therealong to a higher level, said last named means comprising a plurality of clamping rings disposed within the radial space formed by the casing of each rod-gripping device with said carrier rod, means projecting radially inwardly from the wall of the respective casing for holding said clamping rings on one side thereof, and spring means acting respectively against said clamping rings on the other side thereof for holding said clamping rings normally in an angular position which determines the direction in which the respective rod-gripping device is to be respectively anchored to the carrier rod or is to be slidable with respect thereto.

2. Hoisting apparatus according to claim 1, comprising radially adjustable bolt means projecting through the wall of the respective casings of said rod-gripping devices inwardly thereof and having angularly shaped inner ends, for placing said clamping rings into positions extending in a plane perpendicularly to the axis of the carrier rod and thereby disengaging said clamping rings from said carrier rod.

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