March 16, 1971 P. LAUNAY 3,570,207

METHOD OF ADVANCING BRIDGING STRUCTURES MADE FROM PRESTRESSED CONCRETE

Filed July 10, 1969 3 Sheets-Sheet 1

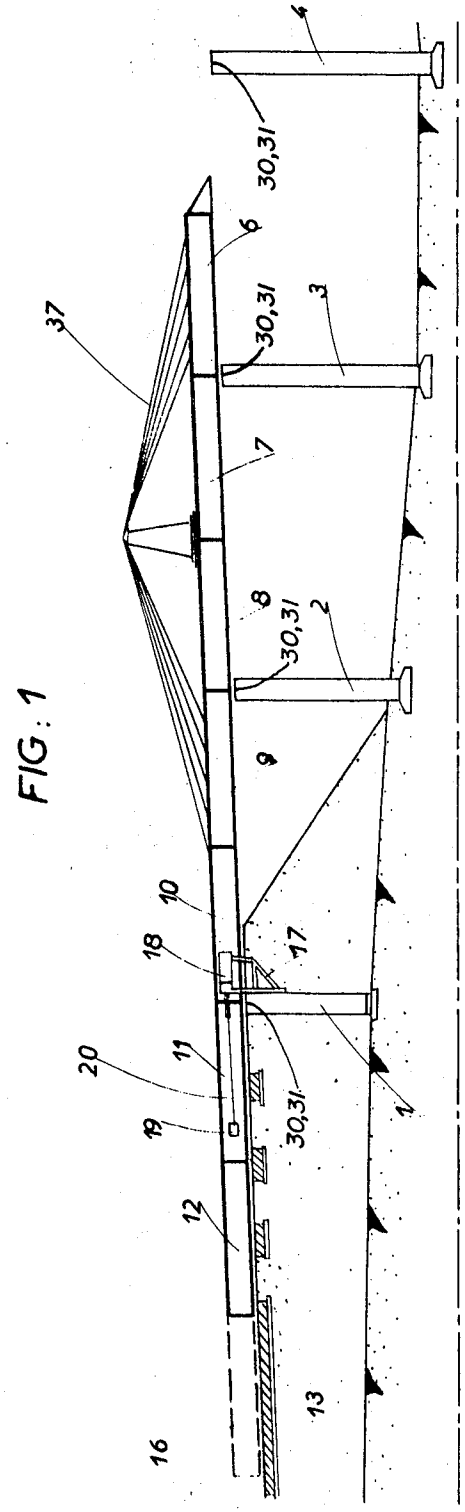


FIG: 1

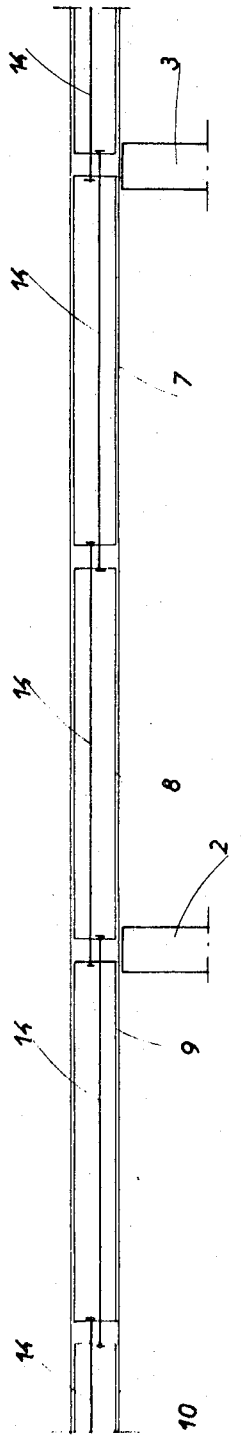


FIG: 2

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Filed July 10, 1969 3 Sheets-Sheet 2

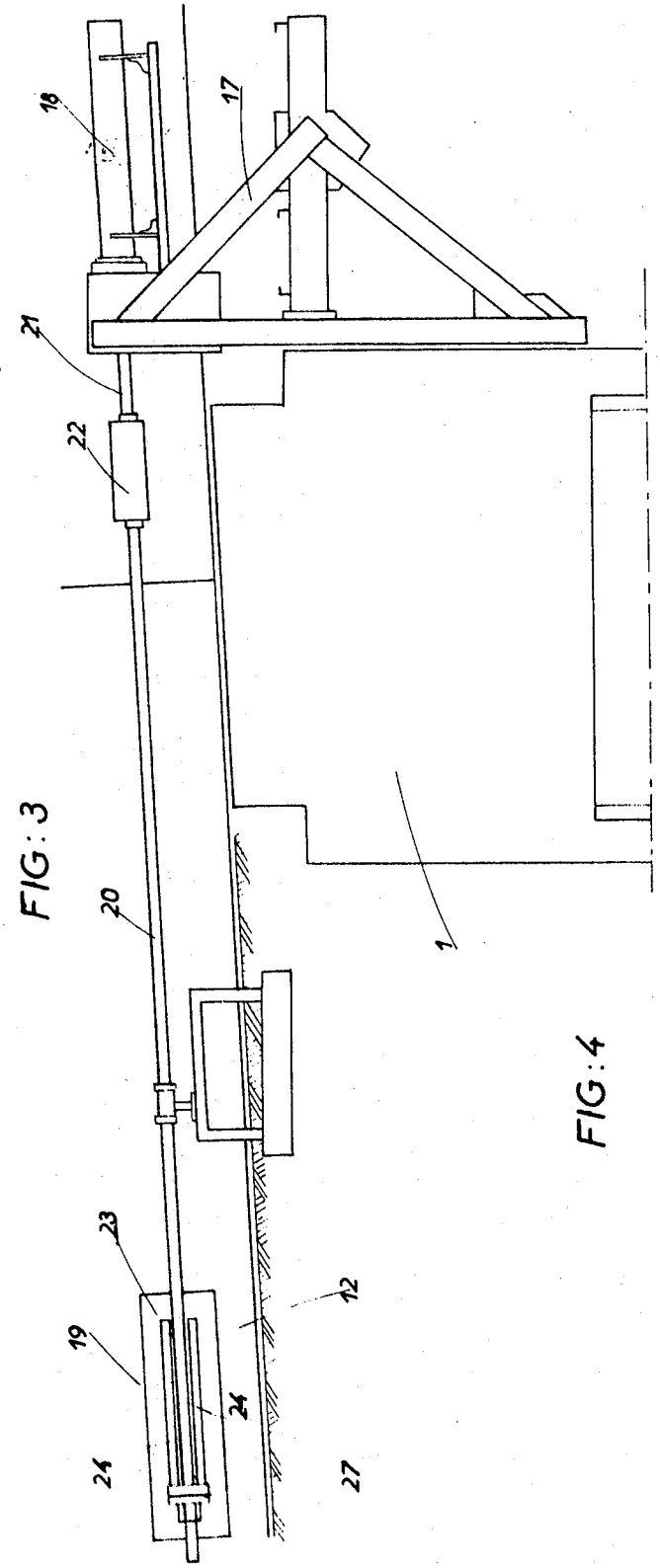


FIG: 3

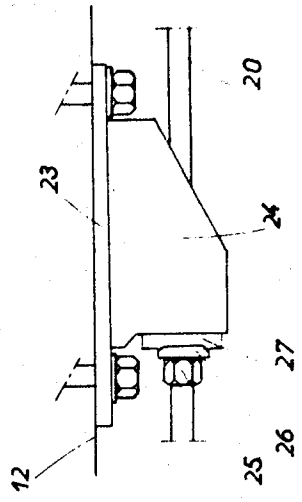


FIG: 4

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FIG:5

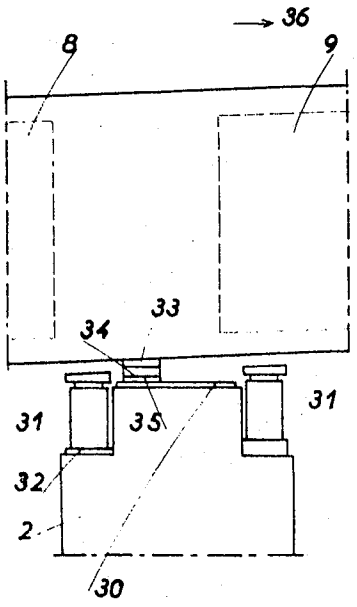


FIG:6

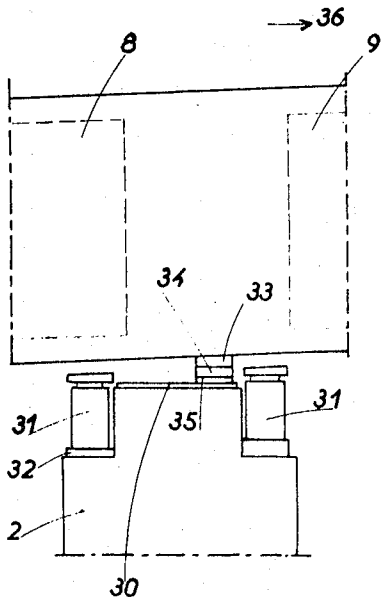


FIG:7

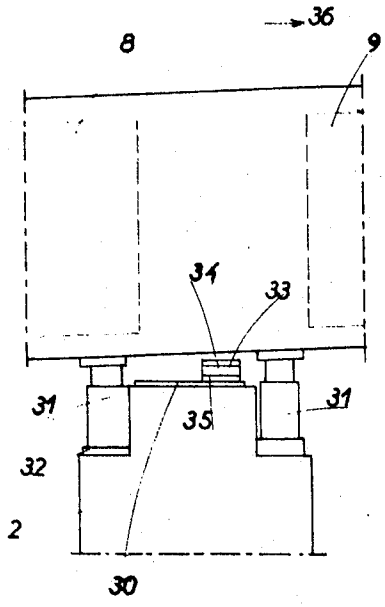
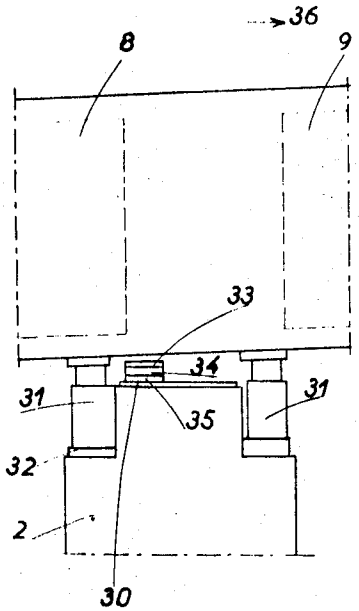


FIG:8



United States Patent Office 3,570,207 Patented Mar. 16, 1971

3,570,207

METHOD OF ADVANCING BRIDGING STRUCTURES MADE FROM PRESTRESSED CONCRETE

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Int. Cl. E04b 1/06, 1/20; E04c 3/20
U.S. Cl. 52—745 4 Claims

ABSTRACT OF THE DISCLOSURE

In the construction of a bridging assembly which will rest on abutment piers and intermediate piers, bridging section are coupled together sequentially and the coupled sections are advanced as a new section is added, joints between the sections being temporarily prestressed at assembly and this prestressing being removed after the assembly of sections is in final position and final prestressing has been installed.

This invention relates to a method of advancing bridging structures made from prestressed concrete, and the apparatus required for performing this method, applicable more particularly to structures such as aqueducts or bridge decks.

In present-day methods for constructing a bridge deck made from prestressed concrete, the girders connecting two successive piers are installed either by means of hoisting machinery supported on the ground or gradually by means of machinery supported on a previously installed girder.

Such systems require cumbersome and expensive machinery, particularly in the case of long-span girders or very high piers.

According to the invention, which obviates these disadvantages, the structure is formed by sections of provisionally prestressed concrete cast successively on a prefabrication zone and then successively connected to one another with provisional prestressing of the connection between two adjacent sections, the assembly being progressively advanced from an abutment pier by sliding on the piers and abutments after each new section has been added, the provisional prestressing then being removed after installation of the final prestressing on the assembly in its final position.

The invention will now be described in greater detail with reference to a specific embodiment given by way of example and illustrated in the accompanying drawings.

This example relates to the construction of a bridge decking.

FIG. 1 is a diagrammatic illustration of a bridge during construction by the method according to the invention.

FIG. 2 is a detail showing the connection of successive box sections.

FIG. 3 is a detail of the advancing system for advancing the bridge decking.

FIG. 4 is a partial top view of FIG. 3.

FIGS. 5, 6, 7 and 8 are partial longitudinal sections of the top part of an intermediate pier showing four stages during the advance of the bridge decking.

Referring to FIG. 1, the bridge comprises an abutment pier **1** and intermediate piers **2**, **3**, **4**, etc .The bridge decking consists of box-sections **6**, **7** . . . **12**, which are cast in provisional longitudinal prestressing on a prefabrication zone **13**; in FIG. 1, the box-section **16** is in the process of prefabrication. As the bridge decking advances, the successive box sections are connected to one another as shown in FIG. 2. The connection of two adjacent box sections is provisionally prestressed by cables **14**.

The abutment pier **1** is provided with a framework **17**,

which forms a support for two hydraulic jacks **18** disposed one on each side of the bridge decking and each adapted, in the specific case of the installation described, to a force of 100 metric tons and a travel of about 1.10 metres.

The rod of the jack **18** is connected by a tie-rod **20** to a securing bracket **19** secured to the box section.

Referring to FIGS. 3 and 4, each jack **18** rests on members of the supporting framework **17** and its rod **21** is connected by a coupling member **22** to the screw-threaded rod **20** which forms the tie-rod. The securing bracket **19** is fixed to the outer surface of the box section **12** and is formed by an end plate **23** and two side plates **24** between which the screw-threaded rod **20** passes.

A nut **25** engages the screw-threaded rod and forms a stop on a washer **26**, the other surface of which has a convex spherical face, and an abutment plate **27** with a concave spherical face. The other surface of the plate **27** bears against the end of the side plates **24**.

Referring to FIGS. 5, 6, 7 and 8, the top portion of an intermediate pier **2** has a set of stainless steel guide plates **30** secured to the pier concrete, and a set of hydraulic jacks **31** in special housings and each resting on a neoprene distribution plate **32**; each of the figures shows just one guide plate **30** and two hydraulic jacks **31**.

Each of the figures shows a portion of the bridge decking. The decking rests on each of the guide plates **30** by means of sliding supports. The top part of each support comprises a baseplate **33** of concrete, which acts as an inclining wedge, a hooped intermediate plate **34** of an elastomer, to the bottom part of which is stuck a panel of cellular tetrafluoroethylene **35**. Given suitable lubrication, the tetrafluoroethylene slides on the stainless steel with a coefficient of friction not greater than 0.04.

After each new box section has been produced, and the connection to the previous box section has been provisionally prestressed, the resulting system is advanced by a succession of incremental thrusts which cause the decking to advance by about 1 metre at a time.

A the start of a cycle of the one metre increment advance in the direction of the arrows **36** in FIGS. 5 to 8, the bridge decking rests on the sliding supports on each pier or abutment as shown in FIG. 5.

At the end of the travel of the jack **18**, the sliding support which has followed the movement of the decking has slid the entire length of the corresponding guide surface as shown in FIG. 6. In the next stage shown in FIG. 7, the lifting jacks **31** are actuated and raise the decking and free the sliding supports which can then be moved back to the other end of the guide surface as shown in FIG. 8, the cycle recommences by releasing the jacks, which lower the decking onto the sliding supports as shown in FIG. 5 in readiness for a fresh advance by 1 metre.

Similarly, after each increment of advance and resetting of the jack **18** to the initial position, the plate **27** transmitting the jack force to the bracket **19** is moved on the screw-threaded rod **20** by a distance of 1 metre. The bracket **19** is not moved to another point of the decking until complete sliding through the length of one box section. The spherical face of the washer **26** against the plate **27** allows the slight angular displacements to be compensated.

A temporary reinforcement of the bridge decking during the advance operations is provided by guying **37** of the leading box sections as shown in FIG. 1. The guying consists of cables anchored in the box sections and extending from the top of a metal post. The guying is not required when the structure to be built has a high inertia, as is the case for example with a large-diameter aqueduct. It is advantageous in the case of relatively long-span bridges because it greatly reduces the provisional pre-

stressing and provides control of the sag of the overhanging portion of the decking and reduces it to a limit of a few centimetres.

When the decking assembly has been brought into its final position, the final prestressing cables of a conventional parabolic configuration are introduced into the box-sections. The provisional prestressing cables are then removed and it is advantageous to note that the provisional prestressing enables most of the plastic creep of the concrete to occur during the decking advance operations before final prestressing is carried out.

Furthermore, the invention enables the provisional prestressing wires, strands or rods to be re-use during the installation of the final transverse prestressing of the structure formed by the box sections or groups of parallel box sections. This re-use results in considerable savings.

Of course embodiments differing in detail from the embodiment described hereinbefore as an example still come within the scope of the invention.

Thus, for example, the deck guidance during the advancing operations may be completed by lateral jacks disposed temporarily at the top of the piers to provide any corrections necessary during the lateral and forward movement of slightly curved box sections. The screw-threaded rods connecting the decking to the advancing jacks could also be replaced by smooth rods, in which case the drive plates would be secured in position on the rods by other known locking means.

The method described in connection with a bridge applies equally well to aqueducts, beams and any prestressed structure of a substantially constant height intended for bridging trenches or valleys.

The configuration of the structure may be curved and the longitudinal profile may slope.

I claim:

1. A method of constructing and advancing a bridging structure of prestressed concrete resting on abutments and intermediate piers, the steps of forming the structure by sections of provisionally prestressed concrete cast successively on a prefabrication zone at one end of the

bridging structure, then successively connecting said sections to one another with provisional prestressing of the connection between two adjacent sections providing a connected assembly, then progressively advancing the connected assembly away from the prefabrication zone and from an abutment pier by sliding said sections on the piers and abutments after each new section has been added, and then removing the provisional prestressing after installation of the final prestressing on the assembly in its final position.

2. A method according to claim 1, including the step of guying the overhanging sections of the assembly whereby prestressing of the sections is reduced.

3. A method according to claim 1, advancing the connected assembly by sliding the connected assembly on the piers or abutments on sliding supports which remain stationary relative to the assembly during the movement and sliding on guide surfaces disposed on the piers or abutments.

4. A method according to claim 3, the connected assembly being advanced in increments, each incremental cycle successively comprising the steps of movement of the sections, then raising of the assembly to free the sliding supports, then positioning the sliding supports relative to the assembly, and then lowering the assembly to rest on the piers and abutments and on the sliding supports.

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U.S. Cl. X.R.

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