Jan. 13, 1970 F. SÖFFGE 3,488,787

PREFABRICATED BRIDGE PLACING VEHICLE

Filed March 18, 1968 3 Sheets-Sheet 1

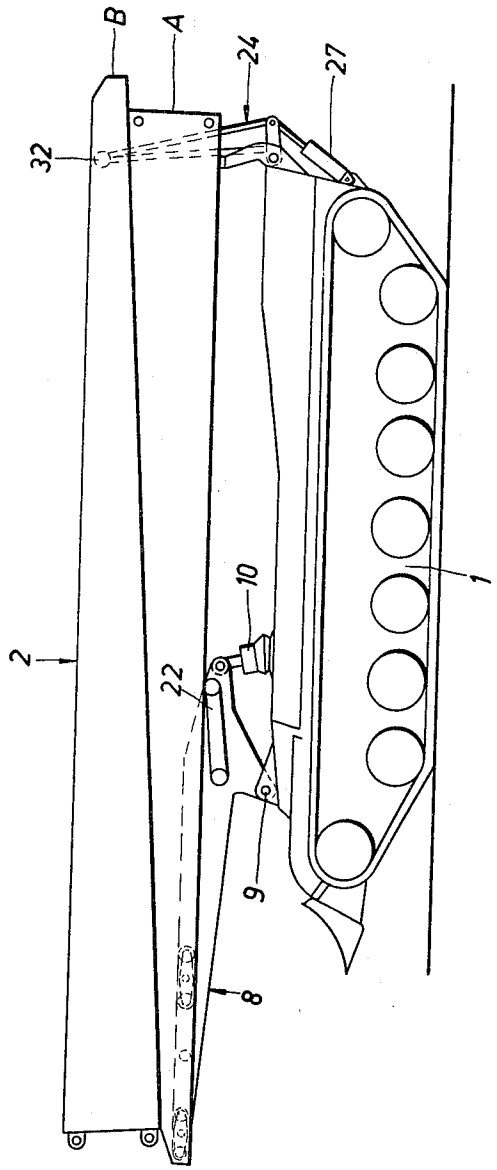


Fig. 1

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Filed March 18, 1968 3 Sheets-Sheet 2

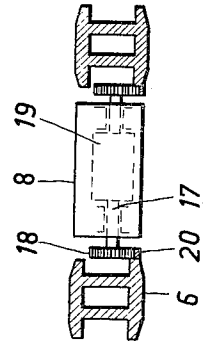


Fig.4

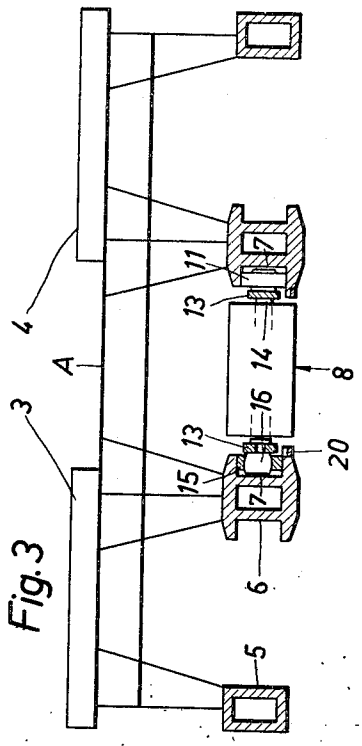


Fig.3

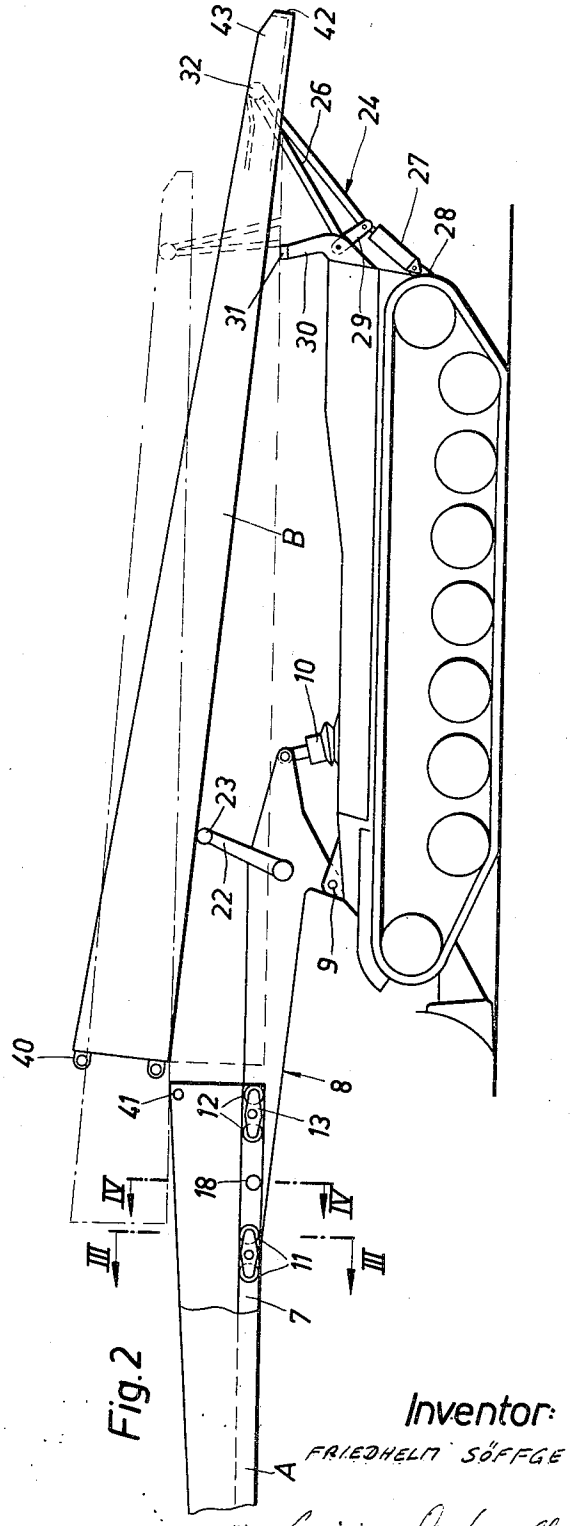


Fig.2

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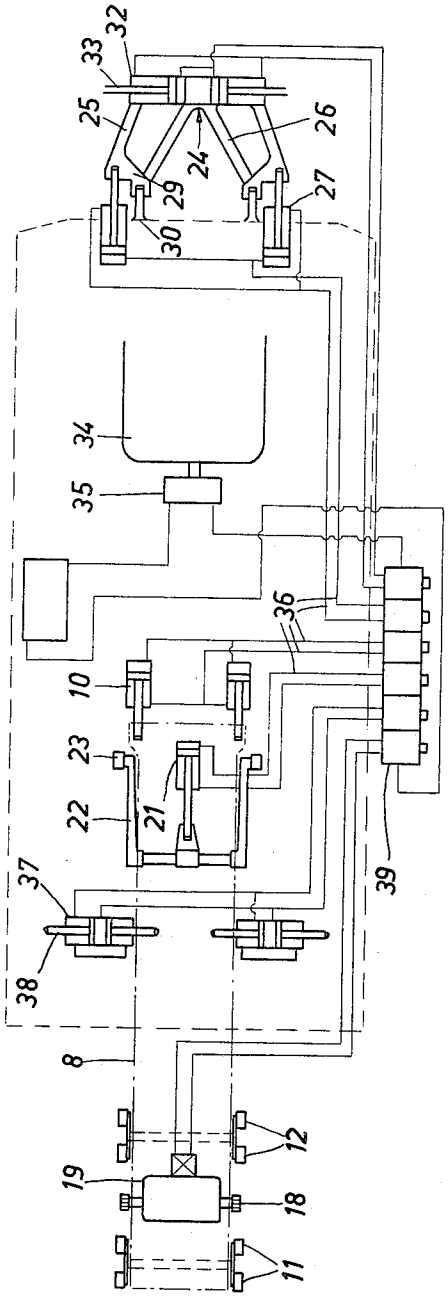


Fig. 5

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PREFABRICATED BRIDGE PLACING VEHICLE

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Int. Cl. E01d 15/12
U.S. Cl. 14—1 11 Claims

ABSTRACT OF THE DISCLOSURE

A powered vehicle with a pivotally mounted front boom for slidably moving longitudinally forward a lower bridge portion, a pivotally mounted rear boom for slidably moving longitudinally rearward a top bridge portion, and support arms pivotally carried by the front boom for lowering the top bridge portion into aligned position with the lower bridge portion. Hydraulic power cylinders are provided for locking the rear boom to the top bridge portion and power means are provided for locking the two bridge portions together in the aligned position. Thereafter, the connected bridge as a unit is moved forwardly and placed in position by the forward boom.

BACKGROUND OF THE INVENTION

It is known to provide a motor vehicle with a device for assembling a prefabricated multipart bridge, which device includes a boom swingably attached to the vehicle on which the bridge portions, with the provision of support rollers, are guided in longitudinal support guide tracks.

In a known arrangement of this type, the bridge is guided on a swingable boom which can be telescopically extended. For assembly of the bridge portions, the boom is provided with a swinging arm, operated independently from the boom, which is connectable with the second bridge portion lowered to the plane of the first bridge portion. Lowering of the first bridge portion is accomplished by moving out the telescopic boom by the aid of hydraulic support struts which are fastened to the vehicle. The assembled bridge may, subsequently, be moved out by the extending telescopic arm with the provision of support rollers and may, thereafter, be placed in front of the vehicle. This device requires exceptionally close dimensional tolerances of the guide arm and guide members in relation to each other as well as the manufacture of undistorted bridge portions which are difficult to produce and costly to obtain.

SUMMARY OF THE INVENTION

In contradistinction, the object of the invention is to provide a simple and reliable device for the assembly and placement of multi-part bridges for which a single boom may be used for placing of assembled bridge portions and which, through the use of a small support base, provides a self-supporting mounting of the bridge.

According to the invention, the first bridge portion by means of a front boom is slidably supported in the direction of the longitudinal vehicle axis underneath the second bridge portion. The second bridge portion, slidable in the opposite direction by means of a rear boom and support arms swingably attached to the front boom, may be lowered into aligned position with respect to the first bridge portion. By organizing the device with consideration given to the movement sequences in assembling the bridge portions, a considerable simplification of the placing device is obtained and, at the same time, the advantage is attained that the front boom may be used as a support roller arrangement, which provides a simple means

for removing the bridge from the vehicle. For this purpose, the bridge portions are advantageously provided with box-type or hollow extrusion profiles which form the guide tracks receiving therein the support rollers of the front boom. The support rollers are advantageously combined in double roller pairs, which are fastened to the front boom at a longitudinal distance from each other to form the support base for the coupled bridge portions during placing them in front of the vehicle. To compensate for manufacturing inaccuracies, each of the support rollers consits of a cylindrical outer ring held swingingly on a curved or bowed bearing body which is non-rotatably connected with a rocker arm swingingly held at the front boom. The front boom consists advantageously of a single box-type support extending between the parallel roadway tracks of the bridge portions which is operated by hydraulic working cylinders and which contains the hydraulically actuated operating cylinder for the support arms. A compact construction is thereby created which, in addition, lends itself for housing the drive means for advancing the bridge. The rear boom is advantageously constructed as a support arm swingably arranged at the vehicle and having hydraulically operated cylinders with opposite ends provided with locking piston rods arranged at right angles to the longitudinal axis of the vehicle for locking the rear end of the second bridge portion. By such a construction, a light and torsionally stiff assembly is obtained.

BRIEF DESCRIPTION OF THE DRAWING

Further objects, features and advantages of the present invention will become clear from the following description of a preferred embodiment shown in the drawing, wherein:

FIGURE 1 shows a side view of the tracked vehicle including the inventive device for assembling and placing a multipart prefabricated bridge shown in the transporting position.

FIGURE 2 shows a side view of the tracked vehicle according to FIGURE 1 in the various phases of assembling the bridge portions.

FIGURE 3 shows a cross section through the drawbridge along line III—III of FIGURE 2, in an enlarged scale,

FIGURE 4 shows a cross section through the drive of the drawbridge along line IV—IV according to FIGURE 2 and

FIGURE 5 shows schematically the hydraulic operating arrangement for assembling and placing of the bridge including the indicated parts of the locking and placing mechanisms.

DETAILED DESCRIPTION OF THE INVENTION

A roadway track bridge **2** is mounted on a tracked vehicle **1** and consists of a bridge portion A and a bridge portion B having identical dimensions. The bridge portions A and B are held in the transporting position on top of each other as shown in FIGURE 1. The bridge portion A includes, the same as bridge portion B, two parallel longitudinally extending horizontal roadway tracks **3** and **4**, with lower girders **5** and **6** constructed as extrusions. The inner lower girders **6** form guide tracks **7** between which extends a front boom **8**. The front boom consists of a single carrier constructed as a box-section which is arranged swingably about a pivot axis **9** at the vehicle and is operated by means of hydraulic working cylinders **10**. Support roller pairs **11** and **12** are arranged at both sides of the front boom **8** at a longitudinal distance from each other and fastened to the rocker arms **13**. Each of the rocker arms **13** is pivotally connected about a bolt **14** to the front boom **8**. The support rollers consist of a cylindrical outer ring **15** held swingingly on a curved or bowed bearing body **16**. The bearing body **16** is solidly connected

with the rocker arm 13. Between the support roller pairs 11 and 12, gears 18 are fastened on a common shaft 17 which serve for advancing the bridge and which are driven by a hydraulic motor 19, housed in the front boom 8 through a self-locking worm device, not shown in the drawing. The gears 18 are in engagement with a gear rack 20 which is connected with the inner lower girder 6.

In the front boom 8 is further arranged the hydraulic operating cylinder 21 for the support arms 22 which are pivotally mounted on the front boom 8 and which serve for lowering of the bridge portion B after supporting the bridge portion A during forward movement in the longitudinal direction of movement of the vehicle. For this purpose, the support arms 22 are provided with freely rotating rollers 23 which freely engage the girder 6 from below. At the rear end of the tracked vehicle 1, a rear boom 24 is pivotally mounted, which consists of support arm pairs 25 and 26. Each of the support arm pairs 25 and 26 is under the action of a hydraulic working cylinder 27 which is movable about a bearing block 28 fastened to the vehicle. The support arm pairs 25 and 26 and their respective working cylinder 27 are connected to guide 29 which is swingably connected to a rear support bracket 30. The support bracket 30 is provided with a crossbeam 31 which supports the bridge. The support arm pairs 25, 26, at the free end thereof, are provided with locking cylinders 32 which are directed perpendicular to the longitudinal axis of the vehicle and have piston rods 33 which are connectable with the bridge portion B.

The hydraulic plant includes a pump 35, driven by an internal combustion engine 34, by means of which and through a piping arrangement 36, the working cylinders 13, 21, 27, 32 as well as motor 19 for advancing the bridge, may be supplied with pressure fluid. For locking the bridge portions A and B in the use position, additional working cylinders 37 are provided with piston rods 38, which serve as connecting members. Control pistons or valves 39 are connected in series with all the above mentioned working and locking cylinders to control the supply of pressure fluid thereto from a single location.

In order to move the bridge portions A and B from the transporting position shown in FIGURE 1 into the use position, portion A, with the help of motor 19 and the gear drive 18, 20, is first moved out on the front boom 8 in the direction of the vehicle longitudinal axis until it reaches the position shown in FIGURE 2. The position may be automatically determined by means of a known hydraulic limit control. During this process, bridge portion B remains in the position as shown in dot and dash lines in FIGURE 2. Subsequently, the support arms 22 are moved underneath the bridge portion B with the help of the working cylinder 21 and the rear boom 24 is swung to the right when viewing the drawing until it reaches the position shown in solid lines. Thereafter, the bridge portion B is lowered into aligned position with the bridge portion A by means of the support arms 22. By the rearward movement of the bridge portion B, the connecting cover plates 40 arranged at each roadway track of the bridge portion B, reach a position adjacent bores 41 in the bridge portion A. By means of the piston rods 38 or the locking cylinders 37 which may be moved through the cover plates 40 and bores 41, the bridge portions A and B will be connected with each other. After retracting the locking cylinder 32 of the rear boom 24, the coupled bridge may now be moved out in the longitudinal direction of the vehicle until one of the support rollers of the support roller pair 12 comes into contact with the end stop 42 of the guide track 7 in the bridge portion B. The bridge in this position is held self supportingly by the front boom 8 and may be let down in front of the vehicle by swinging the boom with the working cylinder 10. During this process, the support roller pair 12 first slides out of one recess 43 in the guide tracks 7, whereas the support roller pair 11 is removed from the bridge when the vehicle is backed up. The picking up and separation of the bridge for transportation is accomplished in the reversed sequence.

While a preferred embodiment has been described in detail for purposes of illustration, further embodiments, modifications and variations are contemplated within the spirit and scope of the present invention as defined by the following claims.

I claim:

1. A vehicle arrangement, for assembling from a transport position and placing into a use position a prefabricated multi-part bridge, comprising: a first bridge portion; a second bridge portion on top of the first bridge portion in the transport position; a powered vehicle; a front boom pivotally monuted on the powered vehicle and having support means for slidably supporting the first bridge portion in the longitudinal direction of the bridge relative to the powered vehicle and second bridge portion; power means for pivoting said front boom; means holding said second bridge portion independently of said first bridge portion during forward relative movement of said first bridge portion and means for thereafter lowering said second bridge portion into longitudinally aligned position with said first bridge portion.

2. The vehicle arrangement according to claim 1, wherein said second bridge holding means includes a rear boom pivotally mounted on said powered vehicle for moving the rear end of said second bridge portion rearwardly and downwardly relative to the powered vehicle and the first bridge portion, and said means for lowering said second bridge portion includes support arm means supporting the front of said second bridge portion during the rearward movement of said second bridge portion and thereafter lowering said second bridge portion into the aligned position with said first bridge portion.

3. The vehicle arrangement according to claim 2, wherein said support means includes each of said bridge portions having longitudinally extending reinforcement members having therein roller guiding tracks that are longitudinally aligned with respect to each other in the aligned position of the bridge portions; said support means further including rollers mounted on said front boom and received within said guide tracks.

4. The vehicle arrangement according to claim 3, including means for rigidly connecting said bridge portions together in the aligned position; wherein said rollers comprise a plurality of roller pairs longitudinally spaced with respect to each other to form the sole supporting connection between the powered vehicle and the bridge portions when both said bridge portions have been moved together longitudinally forwardly as far as possible.

5. The vehicle arrangement according to claim 4, wherein each roller pair comprises shaft means pivotally supporting a rocker arm on said front boom, two curved bearing bodies securely mounted on said rocker arm, and two outer cylindrical rings mounted on respective ones of said bearing bodies.

6. The vehicle arrangement according to claim 2, wherein the bridge portions form a two-track bridge in the aligned position with spacing therebetween; said front boom comprises a rectangular beam extending between the two tracks of the bridge portions; and said power means for pivoting said front boom includes hydraulic working cylinders mounted between said front boom and said powered vehicle for pivoting said front boom relative to said powered vehicle; said powered vehicle further including means pivotally mounting said support arm means on said front boom and hydraulically actuated operating cylinder means for pivoting said support arm means relative to said front boom.

7. The vehicle arrangement according to claim 2, wherein said rear boom comprises support arms pivotally mounted on the rear of said powered vehicle at one of their ends and having at their other ends hydraulic operating cylinders and piston rods movable transverse to the

longitudinal direction for selective locking engagement with the rear of the second bridge portion.

8. The vehicle arrangement according to claim **1**, including a rack gear on both of said bridge portions in their aligned position and a hydraulically powered rotatably driven pinion in engagement with said rack gear and rotatably mounted on said front boom.

9. The vehicle arrangement according to claim **1**, wherein each of said bridge portions includes two parallel longitudinally extending horizontal roadway tracks for engagement by the wheels of vehicles traveling the bridge and forming therebetween a central space; two longitudinally extending reinforcement members mounted below respective ones of said roadway tracks and each having an inwardly opening longitudinally extending channel; roller means mounted on said front boom and engaged within said channels; the respective channels of each bridge portion being aligned in the assembled position of the bridge.

10. The vehicle arrangement according to claim **1**, including means for rigidly connecting said bridge portions together in the aligned position; means between

said connected bridge portions and said front boom for longitudinally moving the connected bridge portions as a unit forwardly relative to the powered vehicle to a cantilever extended position wherein the sole supporting engagement between said powered vehicle and said connected bridge portions is roller and track means engaging only the rearwardmost portion of said second bridge portion.

11. The vehicle arrangement according to claim **1**, wherein said powered vehicle has spaced endless ground engaging tracks and a front pivotally mounted scraper blade for clearing land and forming a front outrigger brace during the assembly and forward movement of the connected bridge portions relative to the powered vehicle.

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