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(54) METHOD AND SYSTEM OF DREDGING OF AN UNDERGROUND CONDUIT

VERFAHREN UND SYSTEM ZUM BAGGERN EINES UNTERIRDISCHEN KANALS

PROCÉDÉ ET SYSTÈME DE DRAGAGE D'UN CONDUIT SOUSTERRAIN

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Description

[0001] The present invention relates to a method and system of dredging a channel or duct, for example underground, such as a channel belonging to a sewage system, or drains, spillways, etc....

[0002] It is well known that the municipal sewage networks, which comprise large channels, are in need of maintenance cleaning as a result of the continuous urban expansion and subsequent restorations of the road surface. In fact, often with the arrival of the increasingly heavy summer rains, the central municipal sewers fail to cope with the flow of water, causing flooding and backflow into people's homes.

[0003] It is therefore necessary to clean these medium to large sewage pipes periodically, even in the presence of running water, i.e. without having to interrupt the function of the sewer. It is necessary to extract large quantities of sediment from pipes buried even several dozen metres underground without running any risk. Normally the machinery performing these operations operates from outside the sewer and from the surface.

[0004] Several methods are known for cleaning up such ducts. A first type provides for the insertion of water jet nozzles, as illustrated, for example, in patent application US20110308552, which describes a first nozzle head inserted along the duct that sprays jets of water directly along the duct. The first head is exchanged for a second head connected to a cable and is pulled back to the first position. The nozzle is then pulled back to the second position by pulling the cable while the nozzles directed along the pipe towards the second position push the solids forward to the second position for extraction.

[0005] In a second *modus operandi*, a sediment collection container is used which is made to slide along the canal. The operations are usually carried out by accessing the underground channel through pairs of inspection wells that delimit the section of channel to be cleaned.

[0006] From the first of these wells, a sediment collection container hooked to a first holding cable is lowered into the duct, this container is towed into the duct in the direction of the second well by means of a second cable hooked to the container which is lowered from this second well. Once the container has travelled the full section of channel to be cleaned, it is removed from the second well and emptied into a special collection tank.

[0007] The container for sediment collection is generally shaped like a slide, and the cables are towed by special winches placed on the surface near these inspection wells.

[0008] This second *modus operandi* has the drawback that, having positioned the winches on the surface, the sliding of the towing and holding cables from the wells to the duct can be difficult, since they have to overcome an almost right angle formed between the axis of the well (usually substantially vertical) and that of the channel (usually almost horizontal or slightly inclined). This sliding is even more difficult when, during the dredging step, the

container or slide loaded with sediment has to be towed and when this angle has to be overcome between the bottom of the well and the end of the section of the duct by the US6494437 shows an underground conduit cleaning system as per the preamble of independent claim 1.

[0009] The applicant has solved these drawbacks by realising a system and a method of dredging underground ducts accessible through inspection wells according to the present invention as set out in independent claims 1 and 4.

[0010] Further objects, characteristics and advantages of the present invention will become clear from the following detailed description and the appended figures, provided solely by way of non-limiting example, wherein:

- figure 1 is a schematic view of the system of dredging underground ducts accessible through inspection wells according to the present invention;
- figure 2 is a schematic view of the step of inserting a winch into the inspection well according to the present invention. Referring to the above figures, the system of dredging a duct T (or a section of it), accessible through at least a first P1 and a second P2 inspection channel or access passage, which connect and delimit this section of conduit to the surface S; said system comprises machinery M1 or M2 for positioning a respective winch A1 and A2 along each inspection duct on the junction between each inspection well or inspection channel and said duct.

[0011] The duct may be an underground duct and the inspection wells are vertical channels for access to the indicated section, or it may be an open duct such as a ditch or a canal that is difficult to access through banks that delimit it equivalent to inspection channels. These means are arranged on the surface above the section of duct. Each winch is connected with a cable C1 or C2 which at its free end (the one not engaged with the respective winch) is connected with a sediment collection container S sliding along the section of duct through these winches and which collects the sediments. These machines M1 and M2 comprise means for moving the winches along the inspection channel or well and positioning them on the bottom of it substantially at the same level as the section of duct to be dredged. Such movement means are advantageously realised by means of a telescopic or articulated arm. Such machines are preferably excavators.

[0012] Preferably, the sediment collection container is shaped like a slide or like a bucket provided with a mouth for the collection during the dragging of the sediments and a closed bottom to form a "bag". The method and the system of the present invention are equally applicable in an environmental situation in which the first inspection channel well P1 is an open channel and allows a means to be brought to the level of the quote of the duct to be dredged (fig. 3a) or allows the first winch to be lowered more easily to the level of this duct (fig. 3b).

[0013] The method for removing or dredging a section of channel T according to the present invention accessible through at least a first P1 and a second P2 inspection channel which connect and delimit this section of duct to the surface S essentially comprises the steps of:

- a) preparing a first and a second machinery (M1 and M2) for positioning the respective first and second winches (A1 and A2) proximate to the respective first and second inspection channels (C1 and C2),
- b) lowering the cable (C1 or C2) of the first or second winch (A1 or A2) into the respective inspection channel (P1 or P2) until it crosses the entire section of duct to be dredged (T) and lifting its end from the other inspection channel (P2 or P1),
- c) hooking a sediment collection container (S) to this end of this cable and also hooking it to the cable of the second or first winch (A2 or A1),
- d) lowering the two winches (A1 and A2) in the inspection channels (P1 and P2) until they reach substantially the same quote or level as the section of duct to be dredged, so that the container (S) is located at one of the ends of the channel near the respective winch (A1 or A2),
- e) towing the container through these winches to the opposite end of this section of duct near the other winch (A2 or A1),
- f) lifting the winch that has the container close to itself on the surface (S) for emptying it.

[0014] After emptying, if the dredging operation must always be carried out in the same direction, i.e. always moving the container in the same direction for dredging (for example from P2 to P1 only), for reasons of slope of the channel or for other reasons, the container itself is brought back, making it cross again the duct to be dredged, near the other winch (A2 or A1) to repeat the steps e), f) above.

[0015] If, on the other hand, the dredging operations can be carried out in both directions (indifferently from P1 to P2 or from P2 to P1), in order to carry out a subsequent dredging operation it will be sufficient to rotate the container and lower again the winch that lifted the filled container (after it had been emptied) up to the level of the section of duct to be dredged, and tow the container in the opposite direction until it is near the other winch.

Claims

1. Dredging system of a conduit (T), or a section of it, accessible through at least a first (P1) and a second (P2) inspection channel or access passage, which connect and delimit this section of conduit to the surface (S), such a system comprising:

- machines (M1, M2) for positioning a respective winch (A1, A2) along each inspection channel

on the junction between each inspection channel and said conduit,

- said machines being arranged on the surface above the section of the conduit,
- each winch being connected with a cable (C1, C2) which at its free end is connected with a sediment collection container (S) sliding along the section of duct through these winches and which collects the sediments,
- these machines (M1, M2) comprising means for moving the winches along the inspection channel and positioning them on the bottom of it substantially at the same level as the section of duct to be dredged,

characterised in that the sediment collection container is shaped like a slide or like a bucket provided with a mouth for the collection during the dragging of the sediments and a closed bottom to form a "bag".

2. System according to claim 1, wherein said moving means (M1, M2) comprises a telescopic or articulated arm.
3. System according to claim 1, wherein said machines are excavators.
4. Method for removing or dredging a section of channel (T) accessible through at least a first (P1) and a second (P2) inspection channel or access passage that connect and delimit this section of duct to the surface (S) essentially includes the steps of:

- a) preparing a first and a second machinery (M1, M2) for positioning the respective first and second winches (A1, A2) proximate to the respective first and second inspection channels (C1, C2),
- b) lower the cable (C1, C2) of the first or second winch (A1, A2) into the respective inspection channel (P1, P2) until it crosses the entire section of a conduit to be dredged (T) and lift its end from the other inspection channel (P2, P1),
- c) hook a sediment collection container (S) to this end of this cable and also hook it to the cable of the second or first winch (A2, A1), said sediment collection container being shaped like a slide or like a bucket provided with a mouth for the collection during the dragging of the sediments and a closed bottom to form a "bag",
- d) lowering or positioning the two winches (A1, A2) in the inspection channels (P1, P2) until they reach substantially the same quote or level as the section of the conduit to be dredged, so that the container (S) is located at one of the ends of the channel near the respective winch (A1, A2),
- e) towing the container through these winches

to the opposite end of this section of the conduit near the other winch (A2, A1),
f) lift the winch that has the container close to itself on the surface (S) for emptying it.

5. Method according to claim 4, wherein when the dredging operation is to be carried out by moving the container always in the same direction, after the step f) the container itself is returned, causing it to cross again in the duct to be dredged, near the other winch (A2 or A1) to replicate the steps e), f) above.
6. Method according to claim 4, in which the dredging operations can be carried out by moving the container (S) in both directions to carry out a subsequent dredging operation, it will be sufficient to rotate the container and trace the winch that raised the stuffing container up to the level of the section of duct to be dredged, and tow the container in the opposite direction up to the other winch.

Patentansprüche

1. System zum Baggern eines Kanals (T) oder eines Abschnitts davon, der durch mindestens einen ersten (P1) und einen zweiten (P2) Inspektionskanal oder Durchlass zugänglich ist, die diesen Kanalabschnitt mit der Oberfläche (S) verbinden und begrenzen, wobei ein solches System umfasst:
 - Maschinen (M1, M2) zum Positionieren einer jeweiligen Winde (A1, A2) entlang jedes Inspektionskanals an der Verbindungsstelle zwischen jedem Inspektionskanal und dem Kanal,
 - wobei diese Maschinen an der Oberfläche über dem Kanalabschnitt angeordnet sind,
 - wobei jede Winde mit einem Seil (C1, C2) verbunden ist, das an seinem freien Ende mit einem Sedimentauffangbehälter (S) verbunden ist, der entlang des Kanalabschnitts durch diese Winden gleitet und die Sedimente auffängt,
 - wobei diese Maschinen (M1, M2) Mittel umfassen, um die Winden entlang des Inspektionskanals zu bewegen und sie auf dem Boden des Kanals im Wesentlichen auf der gleichen Höhe wie der auszubaggernde Kanalabschnitt zu positionieren, **dadurch gekennzeichnet, dass** der Sedimentauffangbehälter die Form einer Rutsche oder eines Eimers aufweist, der mit einer Öffnung zum Auffangen während des Schleppens der Sedimente und mit einem geschlossenen Boden versehen ist, um einen "Sack" zu bilden.
2. System nach Anspruch 1, wobei das Bewegungsmittel (M1, M2) einen Teleskop- oder Gelenkarm umfasst.

3. System nach Anspruch 1, wobei die Maschinen Bagger sind.

4. Verfahren zum Entfernen oder Ausbaggern eines Kanalabschnitts (T), der durch mindestens einen ersten (P1) und einen zweiten (P2) Inspektionskanal oder Durchlass zugänglich ist, die diesen Kanalabschnitt mit der Oberfläche (S) verbinden und begrenzen, umfassend im Wesentlichen die folgenden Schritte:

- a) Vorbereiten einer ersten und einer zweiten Maschine (M1, M2) zum Positionieren der jeweiligen ersten und zweiten Winde (A1, A2) in der Nähe des jeweiligen ersten und zweiten Inspektionskanals (C1, C2),
- b) Absenken des Seils (C1, C2) der ersten oder zweiten Winde (A1, A2) in den jeweiligen Inspektionskanal (P1, P2), bis es den gesamten Abschnitt eines auszubaggernden Kanals (T) durchquert, und Heben seines Endes aus dem anderen Inspektionskanal (P2, P1),
- c) Einhaken eines Sedimentauffangbehälters (S) an diesem Ende des Seils und ebenfalls Einhaken desselben am Seil der zweiten oder ersten Winde (A2, A1), wobei der Sedimentauffangbehälter die Form einer Rutsche oder eines Eimers aufweist, der mit einer Öffnung zum Auffangen der Sedimente während des Schleppens und mit einem geschlossenen Boden versehen ist, um einen "Sack" zu bilden,
- d) Absenken oder Positionieren der beiden Winden (A1, A2) in den Inspektionskanälen (P1, P2), bis sie im Wesentlichen die gleiche Höhe oder das gleiche Niveau wie der auszubaggernde Kanalabschnitt erreichen, so dass sich der Behälter (S) an einem der Enden des Kanals in der Nähe der jeweiligen Winde (A1, A2) befindet,
- e) Ziehen des Behälters durch diese Winden zum gegenüberliegenden Ende dieses Kanalabschnitts in der Nähe der anderen Winde (A2, A1),
- f) Heben der Winde, die den Behälter nahe bei sich an der Oberfläche (S) hat, um ihn zu entleeren.

5. Verfahren nach Anspruch 4, wobei, wenn der Baggervorgang durch Bewegen des Behälters immer in die gleiche Richtung durchgeführt werden soll, der Behälter nach dem Schritt f) zurückgeführt wird, wodurch er den auszubaggernden Kanal in der Nähe der anderen Winde (A2 oder A1) erneut durchquert, um die obigen Schritte e), f) zu wiederholen.

6. Verfahren nach Anspruch 4, wobei die Baggervorgänge durch Bewegen des Behälters (S) in beide Richtungen durchgeführt werden können, um einen

nachfolgenden Baggervorgang auszuführen, genügt es, den Behälter zu drehen und die Winde, die den Stopfbehälter angehoben hat, bis auf das Niveau des auszubaggernden Kanalabschnitts zu verfolgen und den Behälter in die entgegengesetzte Richtung bis zur anderen Winde zu ziehen.

Revendications

1. Système de dragage d'un conduit (T), ou d'une section de celui-ci, accessible par au moins un premier (P1) et un second (P2) canal d'inspection ou passage d'accès, qui relie et délimitent cette section de conduit à la surface (S), un tel système comprenant :

- des machines (M1, M2) pour positionner un treuil respectif (A1, A2) le long de chaque canal d'inspection sur la jonction entre chaque canal d'inspection et ledit conduit,
- lesdites machines étant disposées sur la surface au-dessus de la section du conduit,
- chaque treuil est relié à un câble (C1, C2) qui, à son extrémité libre, est relié à un récipient de collecte de sédiments (S) glissant le long de la section du conduit au moyen de ces treuils et qui collecte les sédiments,
- ces machines (M1, M2) comprennent des moyens pour déplacer les treuils le long du canal d'inspection et les positionner sur le fond de celui-ci sensiblement au même niveau que la section de conduit à draguer,

caractérisé en ce que le récipient de collecte des sédiments a la forme d'un toboggan ou d'un godet muni d'une embouchure pour la collecte pendant le dragage des sédiments et d'un fond fermé pour former un "sac".

2. Système selon la revendication 1, dans lequel lesdits moyens de déplacement (M1, M2) comprennent un bras télescopique ou articulé.
3. Système selon la revendication 1, dans lequel lesdites machines sont des excavateurs.
4. Procédé d'enlèvement ou de dragage d'une section de canal (T) accessible par au moins un premier (P1) et un second (P2) canal d'inspection ou passage d'accès, qui relie et délimitent cette section de conduit à la surface (S), comprenant essentiellement les étapes suivantes :

- a) la préparation d'une première et d'une deuxième machine (M1, M2) pour positionner les premier et second treuils respectifs (A1, A2) à proximité des premier et second canaux d'inspection (C1, C2),

b) l'abaissement du câble (C1, C2) du premier ou du second treuil (A1, A2) dans le canal d'inspection respectif (P1, P2) jusqu'à ce qu'il traverse toute la section d'un conduit à draguer (T) et soulever son extrémité à partir de l'autre canal d'inspection (P2, P1),

c) l'accrochage d'un récipient de collecte des sédiments (S) à cette extrémité de ce câble et son accrochage également au câble du second ou du premier treuil (A2, A1), ledit récipient de collecte des sédiments ayant la forme d'un toboggan ou d'un godet muni d'une embouchure pour la collecte des sédiments pendant le dragage et d'un fond fermé pour former un "sac",

d) l'abaissement ou le positionnement des deux treuils (A1, A2) dans les canaux d'inspection (P1, P2) jusqu'à ce qu'ils atteignent sensiblement la même cote ou le même niveau que la section du conduit à draguer, de manière que le récipient (S) se situe à une des extrémités du canal près du treuil respectif (A1, A2),

e) le remorquage du récipient au moyen de ces treuils jusqu'à l'extrémité opposée de cette section du conduit, près de l'autre treuil (A2, A1),

f) le soulèvement du treuil qui a le récipient près de lui sur la surface (S) pour le vider.

5. Procédé selon la revendication 4, dans lequel, lorsque l'opération de dragage doit être effectuée en déplaçant le conteneur toujours dans la même direction, après l'étape f) le conteneur lui-même est renvoyé, en l'amenant à traverser à nouveau dans le conduit à draguer, à proximité de l'autre treuil (A2 ou A1) pour reproduire les étapes e), f) ci-dessus.

6. Procédé selon la revendication 4, dans lequel les opérations de dragage peuvent être effectuées en déplaçant le récipient (S) dans les deux sens pour effectuer une opération de dragage ultérieure, il sera suffisant de faire tourner le récipient et de suivre le treuil qui a soulevé le récipient d'empotage jusqu'au niveau de la section de conduit à draguer, et de remorquer le récipient dans le sens opposé jusqu'à l'autre treuil.

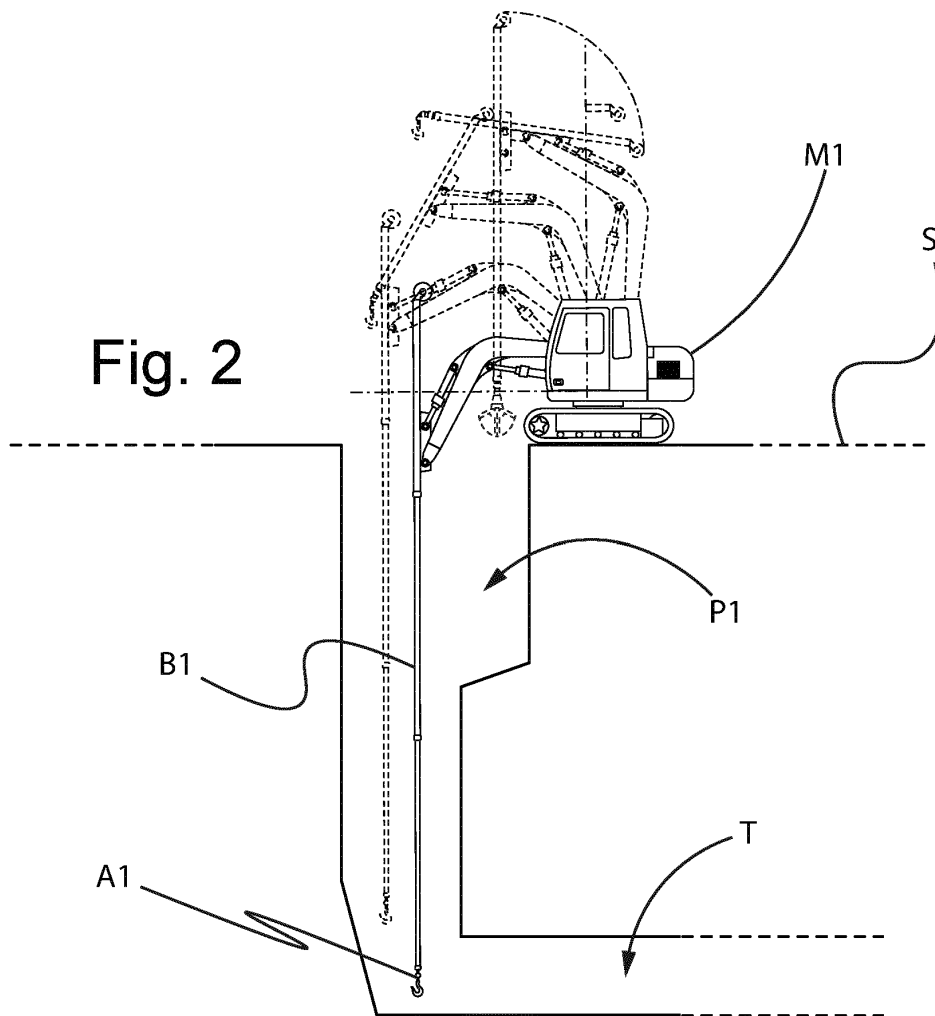
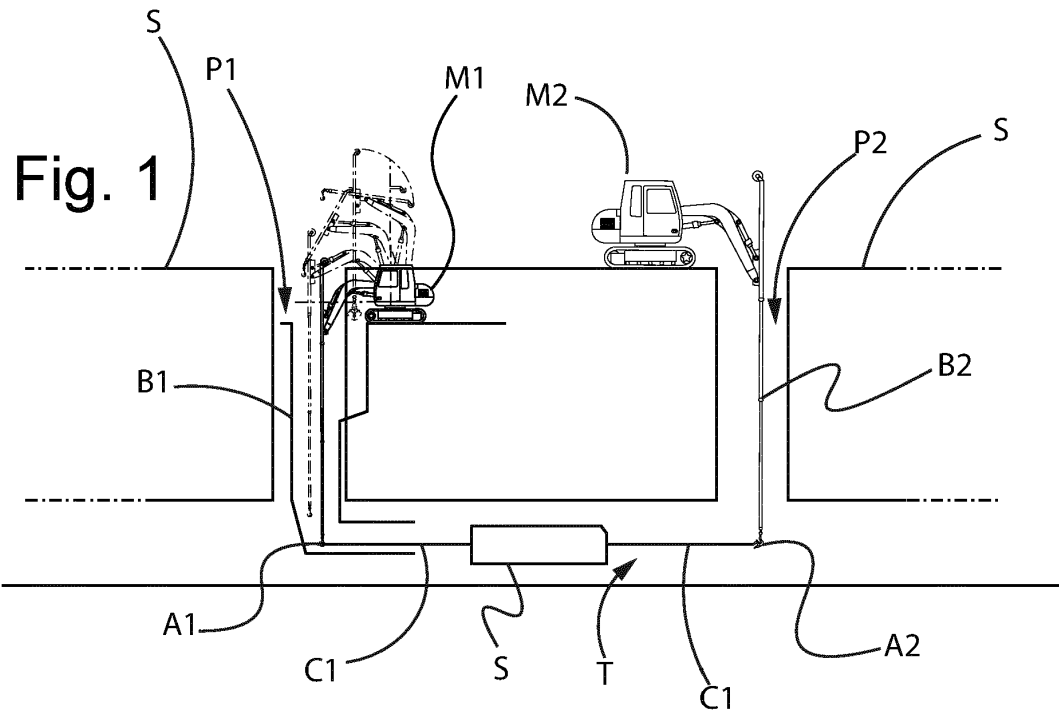


Fig. 3b

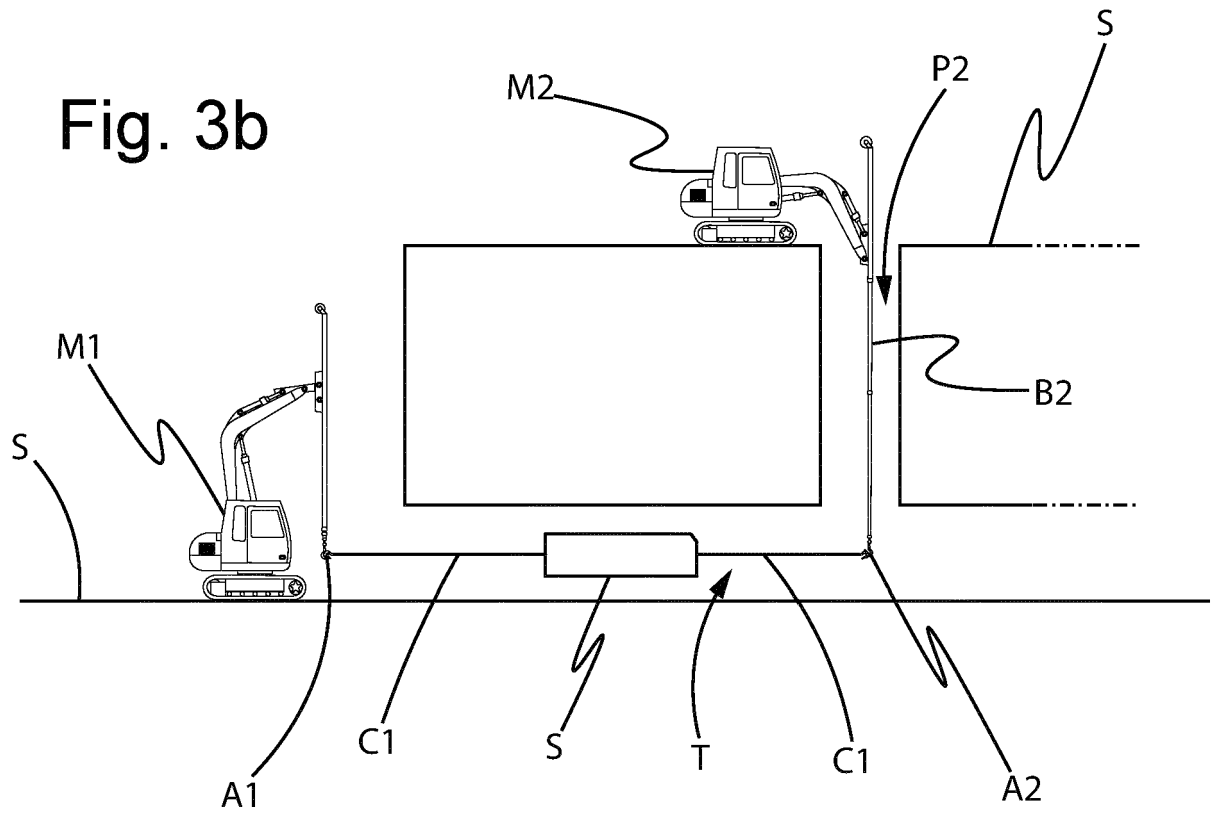
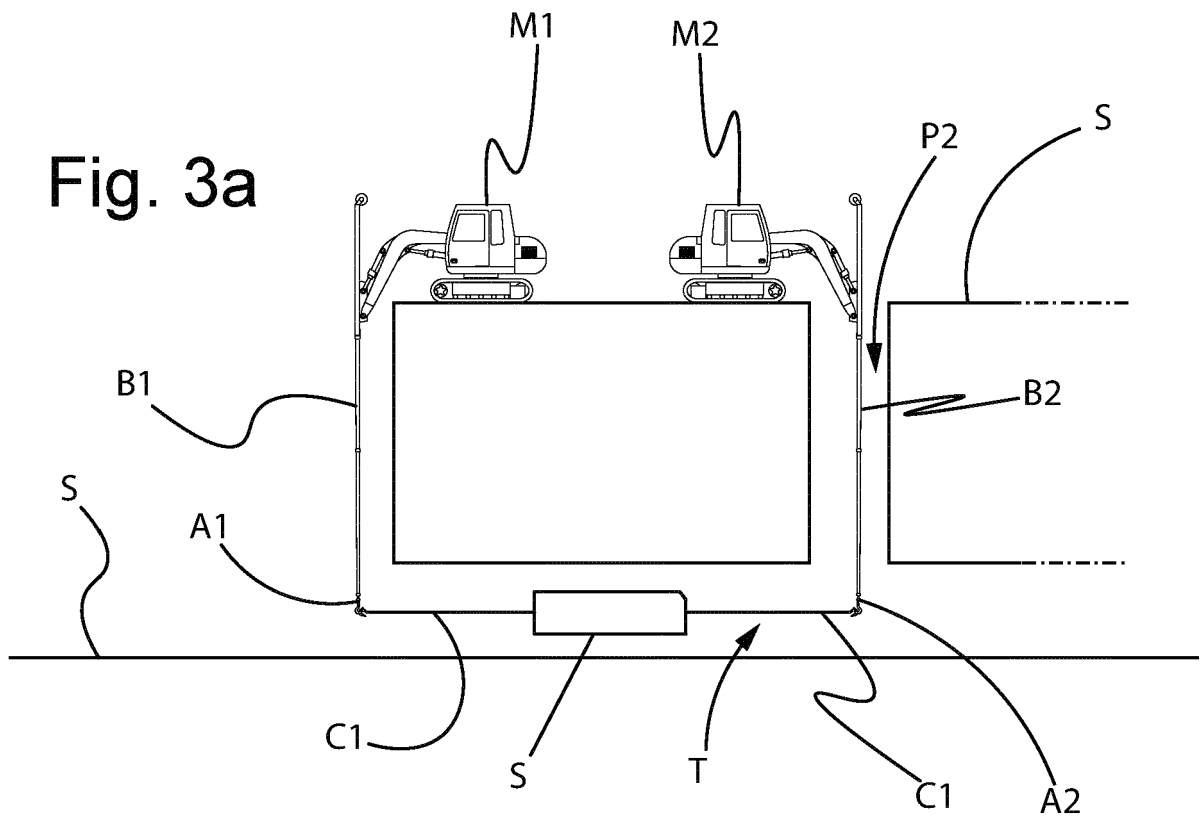


Fig. 3a



REFERENCES CITED IN THE DESCRIPTION

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