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(54) **Method for circumferentially binding a coil having an axis extending horizontally and binding apparatus for use in the method.**

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Description

The present invention relates to a method for circumferentially binding a coil having an axis extending horizontally and binding apparatus for use in the method. In the process a length of binding material, such as for example a binding strip is laid around the circumference of the coil and its ends are fastened together. By saying that the coil has its axis extending horizontally, we do not mean that the invention is restricted to coils whose axis is precisely level. We intend the term to cover any coil which is supported lying on its side, not on its end.

The invention is especially applicable to the binding of coils of steel strip, but is not restricted to this use. The binding of such coils has generally been done manually which, as described below, is an uncomfortable and even hazardous operation. The coil being large, awkward positioning of the body is required, in order to pass a binding strip around it.

Proposals for at least partial automation of this binding have been made. NL—A—70.06235 briefly describes a device which apparently contains a channel along which the binding strip is passed so as to encircle the coil. FR—A—2 024 187 illustrates a machine for binding stacks of newspapers, in which a swinging arm carries string around the stack.

The object of the present invention is to relieve the difficulties, in the form of an awkward position of the body and low reliability encountered during manual binding of large coils.

The present invention as claimed is intended to provide a remedy.

The binding element can be easily secured by the operator, for example when a strip is used as the binding, by sliding a seal over one part of the strip and by stretching and sealing the strip with a known stretching and sealing device. The bound coil can be transported vertically, for example by means of an overhead crane, or horizontally, for example with the aid of a fork-lift truck.

The advantages of the process according to the present invention are that it is no longer necessary for the operator to bend down to insert and pick up the binding element and that increased reliability is achieved in that the coil can now be bound by the operator who remains at one side, so that, as will be described in further detail below, it is no longer necessary for the operator to cross the coil delivery conveyor. In addition, the time needed for binding is shorter because, even in the case of small coils, no more binding is delivered than is strictly necessary. Furthermore, the binding arm can be brought to a rest position in which the coil can be lifted vertically by a crane, since there is no obstacle above the coil.

One embodiment of the invention will be described below and illustrated with reference to

the drawings, in which:

Figure 1 is a diagrammatic overhead view of a stretcher leveller installation for cold-rolled steel strip, including a coil binding station,

Figure 2 is a side view, on section line II—II of Figure 1 of the binding machine embodying the invention,

Figure 3 is an overhead view of the binding machine in the direction of arrow III in Figure 2, and

Figure 4 is a more detailed view of the drive unit marked IV in Figure 2.

Figure 1 shows a stretcher leveller for cold-rolled steel strip. The strip is delivered by the feeding conveyor 2 in the form of coils which are then uncoiled at 3. After being coiled again at 4, the coil is transported by a delivery conveyor 5 which includes a coil lifting carriage 9 (see Figure 2), extending beneath the coiling station, by means of which the coil is transferred to a binding station 60. Here, the coil, which is lying on saddles 23, is bound. Following binding, the coil can be transferred by the coil lifting carriage 9 to one of positions 61 to 65, being rotated about a vertical axis through a quarter of a turn. The coils are removed either from positions 60 to 65 by means of an overhead crane or from position 61 to 65 with a fork-lift truck. The usual coil dimensions are: width 600 to 1500 mm and diameter 1000 to 1800 mm.

In the binding operation, a binding element, e.g. a binding strip, has to be wrapped around the circumference of the coil, including being passed under the coil, and then sealed or secured. When this operation is performed manually, the operator's initial position is at 70. After being placed over the coil, the binding has to be passed back under the coil from position 71. This means that to insert the binding at 71 and to pick it up at 70, the operator has to perform awkward bending movements. In addition, before inserting the binding, the operator has to cross the delivery conveyor line 5, which is a deep, open trough containing the moving coil lifting carriage 9, and after inserting the binding, he has to return from position 71 to 70. These movements are uncomfortable and hazardous.

The binding machine embodying the present invention, which overcomes these difficulties, is shown in Figures 2 and 3. The coil 8 is shown lying on the saddles 23 (which are provided with grooves for insertion of the binding band under the coil) of the binding position 60 of the delivery conveyor 5, which is provided with the coil lifting carriage 9. Mounted on a base plate 10 is a swivelling main arm 11, which can be swung about its pivoting axis by the pneumatic cylinder 12. The end of the main arm 11 remote from the pivoting axis is attached to a rotary binding arm 13, which is pivotally mounted on the main arm so that it can be rotated by a pneumatic rotation cylinder 14 about its centre of rotation 15. At the end of the binding arm 13

which is cranked so as to extend parallel to the axis of the coil, is the binding head 17. The binding arm 13 is balanced around its centre of rotation 15 by a counter-weight 18.

The binding head 17 has a drive unit shown in Figure 4 and a set of hardened steel rollers 19 and 20. The set of steel rollers are able to run freely in one direction, for example by means of a ratchet mechanism (not shown) and can be driven in the same direction by a pneumatic motor 21. The lower roller 20 is mounted on a shaft 25 so that it can be retracted from the upper roller by the actuation of a locking cylinder 22 (see broken lines in Figure 4).

The binding machine operates as follows: the operator remains standing at the left-hand side as seen in Figure 2; after a coil 8 is placed on the saddles 23 of the binding station 60 by the coil lifting carriage 9, the main arm 11 is moved from a rest position A to a working position B by the pneumatic cylinder 12 when the start command has been given. In this working position, the swinging axis of the binding arm 13 is substantially at the axis of the coil (but it may be slightly offset from the coil axis). The binding arm 13 is then swung by the rotation cylinder 14 from position C to its initial operating position D. The binding strip (which is for example one quarter of an inch wide) is then inserted by the operator between the free-running rollers 19 and 20 of the drive unit of transport head 17 and is thus clamped and held by the binding head. A further command is given, which causes the binding arm 13 to be swung from position D to its second operating position C.

This causes the binding head to move through 180° around the circumference of the coil, through a point vertically above the coil axis, so that the binding strip is brought to lie over at least 180° of the coil circumference including more than 90° of the upper half of the coil. Then the set of rollers 19 and 20 are set in motion by the pneumatic motor 21, so that the binding strip is pushed through the grooves (not shown) in the saddles 23 until a predetermined length EC of free strip has been delivered and is protruding up to a position suitable for securing of the ends of the strip. Following this, roller 20 is folded back by the pneumatic cylinder 22 from position F to position G (Figure 4) so that the binding strip is released. Finally, the ends of the strip are secured by the operator and the main arm 11 is returned from position B to its rest position A.

With the main arm 11 in the rest position A, the coil 8 can be removed vertically by means of an overhead crane.

The binding machine is in this embodiment powered by compressed air at 6 atm. The necessary pneumatic equipment is housed in a control cabinet 24. The binding cycle lends itself to control by a programmable control unit.

Claims

1. A method for circumferentially binding a coil (8) having an axis extending horizontally, wherein a length of binding material is passed around the circumference of the coil and its ends are secured together, characterised by the steps of

a) moving the binding head (17) into an initial operating position (D), said binding head having means (19, 20) for holding said binding element and for causing said binding element to pass longitudinally in the binding direction through the binding head (17) and being carried by a binding arm (13) which is arranged to swing around an axis spaced from the binding head (17),

b) engaging the binding element in the binding direction in said binding head (17) so as to be held thereby,

c) causing said arm (13) to swing around its said axis from said initial operating position (D) to a second operating position (C) so as to carry the binding element held by the binding head (17) circumferentially around the coil (8) so that the binding element is caused to lie around at least 180° of the coil circumference including a major part of the upper half of the circumference of the coil (8),

d) operating said binding head (17) when in said second operating position (C) so as to pass a sufficient length of said binding element longitudinally in the binding direction through the binding head (17) to provide a free end length of the binding element suitable for securing to the other end of the binding element and guiding said free end length of the binding element under the coil (8) by a groove located in a support (23) for the coil, and

e) causing the binding head (17) to release the binding element so as to allow the securing of the ends of the binding element so as to allow the securing of the ends of the binding element to each other.

2. Binding apparatus for use in carrying out the method of claim 1, having a binding arm (13) carrying a binding head (17) and rotatably mounted so as to swing around an axis spaced from said binding head (17) from an initial operating position (D) to a second operating position (C), the binding head (17) having releasable holding means (19, 20) for an elongate binding element and drive means (21) adapted to cause the binding element, when held by the holding means (19, 20), to pass longitudinally through the binding head (17).

3. Binding apparatus according to claim 2 wherein said binding arm (13) is rotatably mounted on a second arm (11) which is itself swingable about an axis spaced from the swinging axis of the binding arm (13), the swinging movement of the second arm (11) being such as to bring the swinging axis of the binding arm

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(13) substantially to the position of the coil axis.

4. Binding apparatus according to claim 2 or claim 3 wherein the binding arm (13) is balanced about its swinging axis by a counterweight (18).

Patentansprüche

1. Verfahren zum Umreifen einer Rolle (8) mit einer horizontal sich erstreckenden Achse, bei dem ein Abschnitt eines Reifmaterials über dem Umfang der Rolle geführt wird und seine Enden aneinander befestigt werden, gekennzeichnet durch folgende Verfahrensschritte:

a) es wird ein Umreifungskopf (17) in eine anfängliche Arbeitsstellung (D) gebracht, wobei dieser Umreifungskopf Mittel (19, 20) zum Halten des Reifs und zum längsweisen Bewegen dieses Reifs durch den Umreifungskopf (17) in Umreifungsrichtung aufweist und von einem Umreifungsarm (13) getragen wird, der um eine vom Umreifungskopf (17) entfernte Achse schwenkbar angeordnet ist,

b) der Reif wird in Umreifungsrichtung derart in den Umreifungskopf (17) eingeführt, daß er von ihm gehalten wird,

c) der Umreifungsarm (13) wird um seine Achse von seiner anfänglichen Arbeitsstellung (D) in eine zweite Arbeitsstellung (C) geschwenkt, um den von dem Umreifungskopf (17) gehaltenen Reif in Umfangsrichtung um die Rolle (8) zu führen, so daß der Reif um zumindest 180° des Rollenumfangs einschließlich eines größeren Teils der oberen Hälfte des Umfangs der Rolle (8) zu liegen kommt,

d) der Umreifungskopf (17) wird in der zweiten Arbeitsstellung (C) derart betätigt, daß eine genügende Länge des Reifs längsweise in Umreifungsrichtung durch den Umreifungskopf (17) geführt wird, um einen freien Endabschnitt des Reifs zu erhalten, der für die Befestigung mit dem anderen Ende des Reifs geeignet ist, wobei dieser freie Endabschnitt des Reifs unter der Rolle (8) mittels einer Nut geführt wird, die in einer Trageinrichtung (23) für die Rolle angeordnet ist und

e) der Umreifungskopf (17) läßt den Reif frei, um die gegenseitige Befestigung der Enden des Reifs zu ermöglichen.

2. Umreifungseinrichtung zur Verwendung bei Durchführung des Verfahrens nach Anspruch 1, mit einem Umreifungsarm (13), der einen Umreifungskopf (17) trägt und derart drehbar angeordnet ist, daß er um eine vom Umreifungskopf (17) entfernten Achse von einer anfänglichen Arbeitsstellung (D) zu einer zweiten Arbeitsstellung (C) zu schwenken ist, wobei der Umreifungskopf (17) lösbare Haltemittel (19, 20) für einen langgestreckten Reif sowie Antriebsmittel (21) zum Bewegen des durch die Haltemittel (19, 20) gehaltenen Reifs in Längsrichtung durch den Umreifungskopf (17) aufweist.

3. Umreifungseinrichtung nach Anspruch 2, wobei der Umreifungsarm (13) drehbar an einem

zweiten Arm (11) angeordnet ist, der selbst um eine von der Schwenkachse des Umreifungsarm (13) entfernten Achse schwenkbar ist, wobei die Schwenkbewegung des zweiten Arms (11) so beschaffen ist, daß sie die Schwenkachse des Umreifungsarms (13) im wesentlichen in die Lage der Rollennachse bringt.

4. Umreifungseinrichtung nach Anspruch 2 oder 3, bei der der Umreifungsarm (13) mittels eines Gegengewichtes (18) um seine Schwenkachse ausbalanciert ist.

Revendications

1. Procédé de cerclage circonférentiel d'une bobine (8) ayant un axe disposé horizontalement, dans lequel une longueur de matière de cerclage est passée autour de la circonférence de la bobine et ses extrémités sont assemblées, procédé caractérisé par les phases:

a) de déplacement d'une tête de cerclage (17) dans une position initiale de fonctionnement (D), ladite tête de cerclage comprenant un dispositif (19, 20) pour maintenir ledit élément de cerclage et pour entraîner que ledit élément de cerclage passe longitudinalement dans la direction de cerclage par la tête de cerclage (17) et étant supportée par un bras de cerclage (13) qui est agencé pour pivoter autour d'un axe espacé de la tête de cerclage,

b) d'engagement de l'élément de cerclage dans la direction de cerclage dans ladite tête de cerclage (17) de manière à y être maintenue,

c) d'entraînement dudit bras (13) pour qu'il pivote autour de son axe depuis ladite position initiale de fonctionnement (D) jusqu'à une seconde position de fonctionnement (C) afin d'entraîner l'élément de cerclage maintenu par la tête de cerclage (17) circonférentiellement autour de la bobine (8), de manière que l'élément de cerclage soit amené à reposer autour d'au moins 180° de la circonférence de la bobine, y compris une majeure partie de la moitié supérieure de la circonférence de la bobine (8),

d) de commande de ladite tête de cerclage (17) lorsqu'elle se trouve dans ladite seconde position de travail (C) de manière à faire passer une longueur suffisante dudit élément de cerclage longitudinalement dans la direction de cerclage par la tête de cerclage (17) pour former une longueur d'extrémité libre de l'élément de cerclage qui convient pour la fixation sur l'autre extrémité de l'élément de cerclage et pour guider ladite longueur libre de l'élément de cerclage sous la bobine (8) par une rainure située dans un support (23) de la bobine, et

e) de commande de la tête de cerclage (17) pour libérer l'élément de cerclage afin de permettre la fixation des extrémités de l'élément de cerclage, l'une sur l'autre.

2. Appareil de cerclage pour la mise en oeuvre du procédé de la revendication 1, comprenant un bras de cerclage (13) qui porte une tête de cerclage (17) et monté pour tourner

de manière à pivoter autour d'un axe espacé de ladite tête de cerclage (17) depuis une position initiale de travail (D) jusqu'à une seconde position de travail (C), la tête de cerclage (17) comprenant un dispositif de maintien libérable (19, 20) pour un élément de cerclage allongé et un dispositif d'entraînement (21) adapté pour que l'élément de cerclage, quand il est maintenu par le dispositif de maintien (19, 20) passe longitudinalement par la tête de cerclage (17).

3. Appareil de cerclage selon la revendication 2, dans lequel ledit bras de cerclage (13) est

monté pour tourner sur un second bras (11) qui peut lui-même pivoter autour d'un axe espacé de l'axe de pivotement du bras de cerclage (13), le mouvement de pivotement du second bras (11) étant tel qu'il amène l'axe de pivotement du bras de cerclage (13) pratiquement sur la position de l'axe de la bobine.

4. Appareil de cerclage selon la revendication 2 ou 3, dans lequel le bras de cerclage (13) est équilibré autour de son axe de pivotement par un contrepoids (18).

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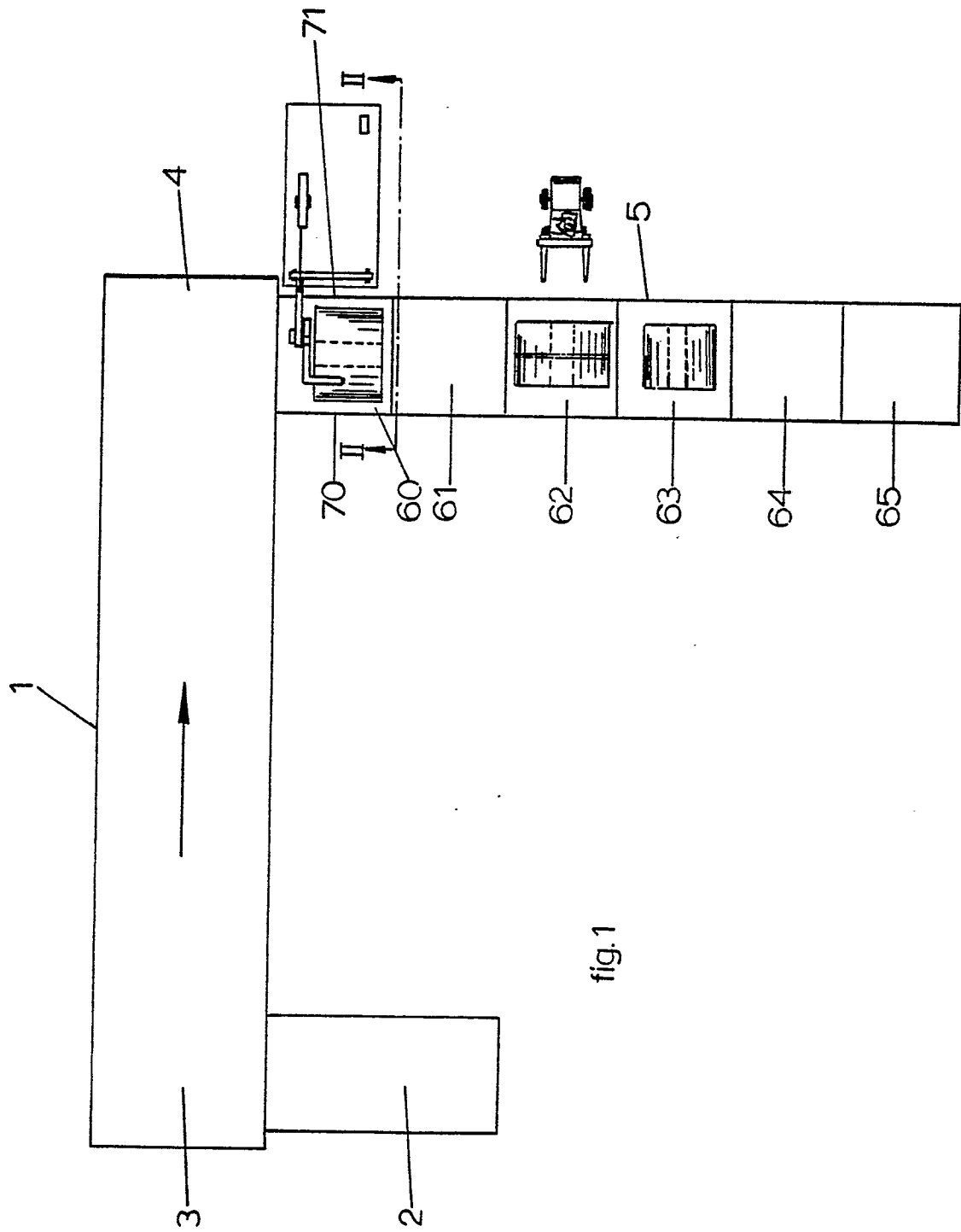


fig. 1

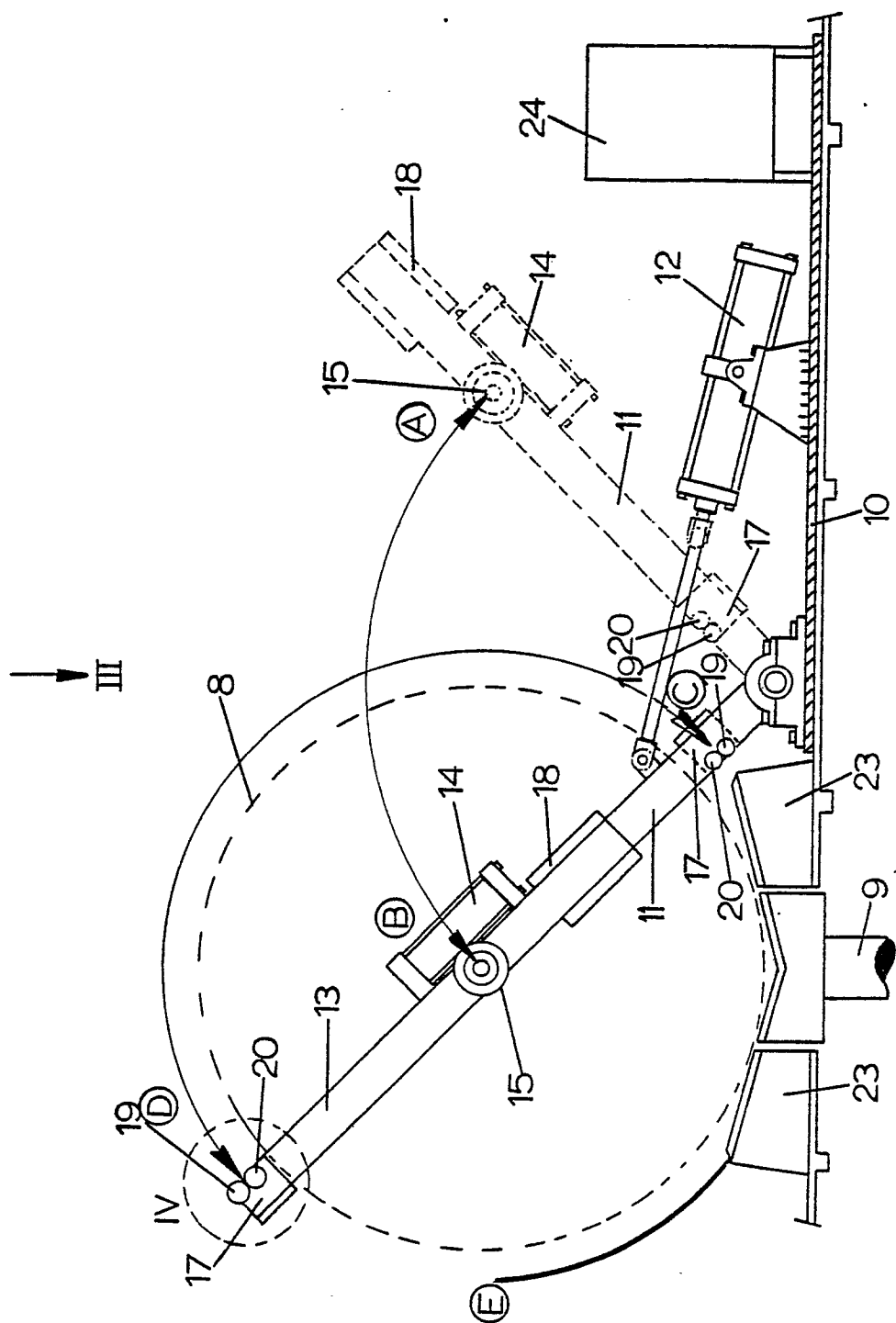


fig. 2

