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(54) Installation for making products of wire-shaped material

Anlage zum Herstellen von Produkten aus drahtförmigem Material

Installation pour fabriquer des produits en fil

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Description

The invention relates to an installation used for making products of metal wire and in which installation they obtain their final shape by means of cold working. Typical examples of such products are bolts, screws and sleeves.

Such installations are discontinuously fed with metal wire which is thereupon cut off in a so-called transfer press. The cut off pieces are subsequently placed under various stamps and matrices by means of a transfer system, in which they are deformed. In this respect it is very important that the volume of the cut off piece is highly constant. This is determined by constantly controlling the length of the cut off wire piece, as well as the diameter thereof.

Every transfer press has its own supply system operating discontinuously and bringing the proper length of the wire under the cutting knife. After that the wire is cut off and brought into the actual press by the supply system. This supply system determines together with the cut off movement, that is to say of the knife, the accuracy of the length of the cut off wire piece. In order to keep the diameter of the wire under surveillance, the diameter of the wire is previously reduced by means of a draw plate. Reducing said diameter of the wire is effected in a wire drawing machine which may be either of the rotary or linear type. In order to limit the number of necessary manoeuvres, these wire drawing machines were more and more positioned in alignment with the transfer press.

Rotary wire drawing machines supply wire to the transfer press with a constant linear velocity, said transfer press discontinuously working the wire. This requires an intermediate reserve system continuously receiving the "wire input" of the wire drawing machine in relation to the pulsating working of the transfer press. Constructing such a reserve system encounters a great problem, particularly with wire diameters larger than 20 mm.

The concept with the linear wire drawing machine is such that this is driven synchronously by the transfer press and continuously produces more drawn wire than the transfer press receives with its supply system. This system is particularly used with large wire diameters, i.e. larger than 20 mm.

These two solutions to reduce the wire in connection with the transfer press are based on the fact that the totality of these two operations, viz. drawing the wire and supplying the wire into the transfer press, are continuously effected as two different workings or operations in different machines.

The invention relates to an installation for making products of wire-shaped material according to the preamble of claim 1. Such an installation is known from US-A-2,228,746. This known installation occupies a great deal of space. Furthermore this installation operates inaccurately as far as the volume of the cut off wire material pieces is concerned.

The invention aims at removing these objections of

the known installation.

This purpose is attained by the application of the features in the characterizing part of claim 1.

By applying these features a more simpler installation is obtained which occupies much lesser space than the known installation, thereby using the supply device of the transfer press for supplying the wire material, said supply device with the drawing mechanism also reducing the wire diameter to the required value. The entire installation has a much smaller number of parts than the known installation, thereby simplifying the maintenance of the installation. Also the operation of the installation is much easier, because the operating person needs much less manoeuvres for putting in a new end of the wire stock. Since with the present installation the mass to be moved is much smaller than with the known installation, the production speed of the press mechanism can be increased. This new wire supplying and drawing system simultaneously delivers the exactly desired length of the cut off wire piece, as well as the precise wire diameter, these being two fundamental conditions which should be met when cold working wire material in transfer presses. Furthermore, a compact and at the same time a robust supply and drawing mechanism for the wire material is obtained.

With a preferred embodiment of the installation according to the invention, the draw plate is mounted in a holder which is movable back and forth on second guides on the carriage, said guides being parallel to the first guides of the carriage.

With this mechanism, the supply of wire material to the press mechanism may be interrupted, viz. by leaving open the wire clamp connected with the carriage and by keeping the fixedly positioned wire clamp closed. With this mechanism it is also possible to draw back the wire material from the press mechanism, e.g. when the number of products to be produced is attained. This can be effected by changing the closing and opening movement of the wire clamp connected with the carriage and of the fixedly positioned wire clamp during the back and forth movement of the carriage.

One embodiment of the invention will be described by way of example and with reference to the accompanying drawing.

Figure 1 is a schematically drawn view of the installation according to the invention for making products of wire-shaped material, and

figure 2 is a more detailed view of the combined wire supply and wire drawing mechanism according to the invention.

The installation according to figure 1 is particularly meant for making products of metal wire and which in this installation obtain their final shape by means of cold working. Bolts, screws, sleeves and the like are typical examples of these products. However, the installation according to figure 1 could also, adapted or not, be used

for making products of plastic wire or of other plastically deformable wire material.

The installation according to figure 1 comprises a wire supply mechanism 1, a wire drawing mechanism 2, a wire cutting mechanism 3 and a wire pressing mechanism 4 which according to the invention are combined into one machine.

The supply mechanism 1 (vide also figure 2) is provided with a carriage 5 which is movable back and forth on guides 6 which are mounted in an arm 7 of the frame 8 of the machine which is schematically drawn. In the carriage 5 a "movable" clamp 9 is mounted, which means that the clamp 9 is fixedly positioned with respect to the carriage 5, but movably with respect to the frame 7, 8 of the machine. The clamp 9 may be operated by a cylinder 10 which is mounted in the carriage 5 and serves for the transportation of the wire 11 in both directions.

The supply mechanism 1 further comprises a "fixed" clamp 12 attached to or fixedly connected to the frame 8 of the machine and which may be operated by means of a cylinder 13 through a toggle lever system 14. One of the jaws of the fixed clamp 12, the lower jaw 12b, is slideably mounted in a guide 16 by means of an extension piece 15. The jaws 9a and 9b of the movable clamp 9 and the jaws 12a and 12b of the fixed clamp 12 preferably operate in such a way that they simultaneously engage in pairs on the wire 11, i.e. alternately the jaws 9a, 9b simultaneously and the jaws 12a, 12b simultaneously.

In the carriage 5 of the supply mechanism is furthermore mounted the drawing mechanism 2 for reducing the diameter of the wire 11, comprising a holder 17 mounted on guides 18 which are parallel to the guides 6. In the holder 17 a draw plate 19 (or a different tool) is mounted for reducing the diameter of the wire 11.

The supply mechanism 1 further comprises a driving device 20 comprising a support 21 on the frame 8 of the machine, a shaft with a crank 22 driven intermittently by the press mechanism 4 or by a synchronous drive, on which crank an adjustable crank pin 23 is mounted which is pivotably connected with a connecting rod 24, a two-armed lever 25 being pivotably connected with the connecting rod 24 between its ends, which lever at its one end is pivotably connected with the carriage 5 and at its other end is slideably mounted with a rectangular recess 26 on a sliding block 27, which is pivotably mounted on an arm 28 attached to a worm wheel 29 being adjustable with a drive worm 30.

On the frame 8 of the machine is further mounted the wire cutting mechanism 3, comprising a back and forth movable cutting knife 31 perpendicularly to the wire 11, and a fixed opposing knife or anvil 32. The cutting knife 32 is guided in a sleeve 33.

The press mechanism or the so-called transfer press 4 in the drawn embodiment is provided with four working stations 34, 35, 36 and 37, which number of stations, however, depending on the product to be produced, may be larger or smaller. The four working sta-

tions 34-37 comprise matrices 34a-37a and stamps 34b-37b. The transfer press 4 further comprises a discharge chute 38 for the finished products.

The operation of the above-described machine is as follows: the supply mechanism 1, i.e. the carriage 5, is drawn in figure 2 in its extreme left position and is moved in its extreme right position prior to the beginning of making products. Next a pointed wire 11 is inserted through the draw plate 19 until the end portion of the wire 11 is inside the open clamp 9. Now the clamp 12 is closed, meaning that the clamping jaws 12a and 12b are pressed onto the wire 11, whereafter the crank 22 is rotated about a half revolution and the carriage 5 is moved to the left, the diameter of the wire 11 being reduced to the desired size over the distance over which the carriage 5 is moved to the left.

After the carriage 5 and consequently the draw plate 19, has reached its extreme left position, the crank 22 stops rotating and the "movable" clamp 9 is closed and the clamp 12 is opened, whereafter the crank 22 again rotates about a half revolution and the carriage 5 is moved into its extreme right position and the wire 11 is transferred over the desired length further into the press mechanism. The drivable knife 31 now cuts off a wire piece 11a of the desired length and diameter from the wire 11. After that the clamp 12 is closed again, the clamp 9 is opened and the carriage 5 is moved again to the left by means of the drive mechanism over the desired distance and the diameter of the wire 11 is reduced to the desired size by means of the draw plate 19 etc., as has been described above.

The length of the cut off wire piece 11a is determined by the distance over which the carriage 5 is moved. This distance is roughly adjustable by moving the crank pin 23 on the crank 24 and can be adjusted more accurately, during operation of the machine, by adjusting the sliding block 27 in the recess 26 in the lever 25 by means of the worm and worm wheel mechanism 28-30.

In this manner the length of the cut off wire piece 11a can be set very accurately. Because the diameter of the wire piece 11a can be very accurately set to the desired value by means of the draw plate 19, wire pieces 11a are obtained having exactly the proper volume, of which products 11b are produced in the transfer press 4 and which leave the transfer press through the chute 38.

Both the movable clamp 9 and the fixed clamp 12 clamp onto the drawn wire end, i.e. wire which has precisely the proper diameter, so that the clamps can be adapted accurately to the wire diameter without causing damage to the wire. The fixed clamp 12 is constructed heavier than the movable clamp 9, because the clamp 12 has to take the drawing force on the wire 11 when drawing the wire through the draw plate 19, and the clamp 9 merely has to transfer the wire 11. The clamps 9 and 12 may be operated pneumatically, hydraulically or mechanically.

The draw plate 19 can be replaced by a roller sys-

tem which then reduces the diameter of the wire 11 by means of a set of rollers.

The movement of the lever 25 could also be realized with a hydraulic or pneumatic cylinder, but such a cylinder is highly liable to wear and gives a much lesser accurate supply length, particularly at a high production speed of the transfer press 4, that is to say more than 30 products per minute.

By putting the draw plate 19 in a holder 17, which in turn can move back and forth in the carriage 5 by means of a guide 18, it is possible to stop the supply of the wire 11. When the carriage is moved to the right, the clamp 9 is kept open and the clamp 12 remains closed. In this way the draw plate 19 with its holder 17 remain in their extreme left position and the carriage 5 will move back and forth over the guide 18 in the draw plate holder. The clamp 12 does not permit the wire 11 to be moved by remaining continuously closed. In this way the supply of the wire to the transfer press can be interrupted, when the operation on the press has to be stopped for whatever reason.

By reversing the actuation of the clamps 9 and 12, the wire drawing supply system can also pull back the wire, supplied into the transfer press, from said transfer press. This is of particular importance in case not all wire should be supplied into the transfer press, e.g. when a predetermined number of products is attained.

Claims

1. An installation for making products of wire-shaped material, comprising a mechanism (1) for intermittently supplying the wire material (11), a mechanism (2) for reducing the diameter of the wire material and a press mechanism (4) to form wire material pieces in the desired shape, a cutting mechanism (3) for the pieces of wire material forming a part thereof, in which said supply mechanism of the wire material (11) is formed by a supply device (1) incorporated in the press mechanism (4), said supply device also being provided with a wire drawing mechanism (2) forming one unit therewith, one and the other such that the supply mechanism (1), the wire drawing mechanism (2), the cutting mechanism (3) and the press mechanism (4) are all combined into one single machine, **characterized in that** the device formed by the supply and drawing mechanisms (1, 2) comprises a carriage (5) which is movable back and forth on first guides (6) by means of a driving device (20), a wire clamp (9) connected with the carriage (5), a fixedly positioned wire clamp (12) and a draw plate (17, 18) mounted on the carriage (5)
2. An installation according to claim 1, **characterized in that** the draw plate (19) is mounted in a holder (17) which is movable back and forth on second guides (18) on the carriage (5), said guides being parallel to the first guides (6) of the carriage (5).
3. An installation according to claim 1 or 2, **characterized in that** the guides (6) for the carriage (5) and the fixedly positioned wire clamp (12) are mounted on the frame of the press mechanism (3, 4).
4. An installation according to one or more of the preceding claims, **characterized in that** the supply mechanism (1) of the wire material (11) is provided with a unit of crank and connecting rod (22-24), the length (l) of the crank arm being variable, and with a two-armed lever (25), which is pivotably connected with the connecting rod (24) between its ends, at its one end pivotably is connected with the carriage (5) and at its other end is supported on an adjustable pivot element (27).
5. An installation according to claim 4, **characterized in that** the other end of the two-armed lever (25) is provided with a longitudinal slot (26) in which a sliding block (27) is mounted, which is pivotably connected with an arm (28) attached to a worm wheel (29) which can be turned with a worm (30).

Patentansprüche

1. Eine Einrichtung für das Herstellen von Produkten aus drahtförmigem Material, mit einem Mechanismus (1) für das intermittierend Speisen vom Drahtmaterial (11), einem Mechanismus (2) für das Verkleinern des Durchmessers des Drahtmaterials und einem Pressmechanismus (4) um Drahtmaterialstücke in der gewünschten Form zu bilden, wobei ein Schneidemechanismus (3) für die Stücke Drahtmaterial ein Teil dessen bildet, in welchem der Speisemechanismus des Drahtmaterials (11) durch eine im Pressmechanismus (4) eingeschlossene Speisevorrichtung (1) gebildet wird, wobei die Speisevorrichtung ebenfalls mit einem damit eine Einheit bildende Drahtziehmechanismus (2) versehen ist, dies alles in einer solchen Weise, daß der Speisemechanismus (1), der Drahtziehmechanismus (2), der Schneidemechanismus (3) und der Pressmechanismus (4) alle in einer einzigen Maschine kombiniert sind, **dadurch gekennzeichnet**, daß die durch die Speise- und Ziehmechanismen (1, 2) gebildete Vorrichtung einen Schlitten (5), der auf ersten Führungen (6) mittels einer Antriebsvorrichtung (20) hin und her bewegbar ist, eine mit dem Schlitten verbundene Drahtklemme (9), eine fest aufgestellte Drahtklemme (12) und eine auf dem Schlitten (5) angebrachte Ziehplatte (17, 18) enthält.
2. Eine Einrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß die Ziehplatte (19) in einem Halter (17) angebracht ist, der auf zweiten Führungen (18) auf dem Schlitten (5) hin und her bewegbar ist, wobei die Führungen parallel zu den ersten Führungen (6) des Schlittens (5) verlaufen.

3. Eine Einrichtung nach Anspruch 1 oder 2 **dadurch gekennzeichnet**, daß die Führungen (6) für den Schlitten (5) und die fest aufgestellte Drahtklemme (12) auf dem Rahmen des Pressmechanismus (3, 4) angebracht sind. 5
4. Eine Einrichtung nach irgendeinem der vorgehenden Ansprüche, **dadurch gekennzeichnet**, daß der Speisemechanismus (1) des Drahtmaterials (11) mit einer Kurbeltriebseinheit (22-24) versehen ist, wobei die Länge des Kurbelarms verstellbar ist, und mit einem zweiarmigen Hebel (25), der mit der Verbindungsstange (24) zwischen seinen Enden schwenkbar verbunden ist an seinem einen Ende schwenkbar verbunden ist mit dem Schlitten (5) und an seinem anderen Ende auf einem verstellbaren Gelenkelement (27) gelagert ist. 10 15
5. Eine Einrichtung nach Anspruch 4, **dadurch gekennzeichnet**, daß das andere Ende des zweiarmigen Hebels (25) mit einer Längsaussparung (26) versehen ist, in welcher ein Schiebepblock (27) aufgestellt ist, der befestigt ist mit einem Arm (28), der mit einem Schneckenrad (2) welcher mit einer Schnecke (30) zu drehen ist, schwenkbar verbunden ist. 20 25
- chariot (5).
3. Installation selon la revendication 1 ou 2, caractérisée en ce que les guides (6) du chariot (5) et la bride fixe (12) de maintien du fil sont montés sur le bâti de la presse (3, 4).
4. Installation selon une ou plusieurs des revendications précédentes, caractérisée en ce que le mécanisme d'alimentation (1) en fil (11) est pourvu d'un ensemble manivelle et bielle (22-24), la longueur (ℓ) du bras de manivelle étant variable, et d'un levier à deux bras (25), relié en pivotement à la bielle (24) en un point situé entre ses extrémités, relié en pivotement par l'une de ses extrémités au chariot (5) et maintenu à son autre extrémité par un pivot réglable (27).
5. Installation selon la revendication 4, caractérisée en ce que l'autre extrémité du levier à deux bras (25) est pourvue d'une fente longitudinale (26) dans laquelle est monté un bloc coulissant (27), relié en pivotement à un bras (28) réuni à une roue à vis (29) pouvant être entraînée à l'aide d'une vis sans fin (30).

Revendications

1. Installation de fabrication de produits en matériaux en forme de fil, comprenant un mécanisme (1) pour fournir, de façon intermittente, du fil (11), un mécanisme (2) pour réduire le diamètre du fil et une presse (4) pour former des pièces de matériau en forme de fil avec la configuration désirée, un mécanisme de coupe (3) des pièces en fil, formant une partie de celle-ci, dans laquelle ledit mécanisme fournissant le fil (11) est formé d'un dispositif d'alimentation (1) incorporé à la presse (4), ledit dispositif d'alimentation étant également pourvu d'un mécanisme de traction (2) du fil, formant un ensemble avec celui-ci, l'un et l'autre tels que le mécanisme d'alimentation (1), le mécanisme de traction du fil (2), le mécanisme de coupe (3) et la presse (4) composent une seule machine, caractérisée en ce que le dispositif formé par les mécanismes d'alimentation et de traction (1, 2) comprend un chariot (5), mobile vers l'arrière et vers l'avant sur des premiers guides (6) au moyen d'un dispositif d'entraînement (20), d'une bride de maintien du fil (9) reliée au chariot (5), d'une bride fixe (12) de maintien du fil et d'une plaque de traction (19) montée sur le chariot (5). 30 35 40 45 50
2. Installation selon la revendication 1, caractérisée en ce que la plaque de traction (19) est montée sur un support (17) mobile vers l'avant et vers l'arrière sur de seconds guides (18) du chariot (5), lesdits guides étant parallèles aux premiers guides (6) du 55

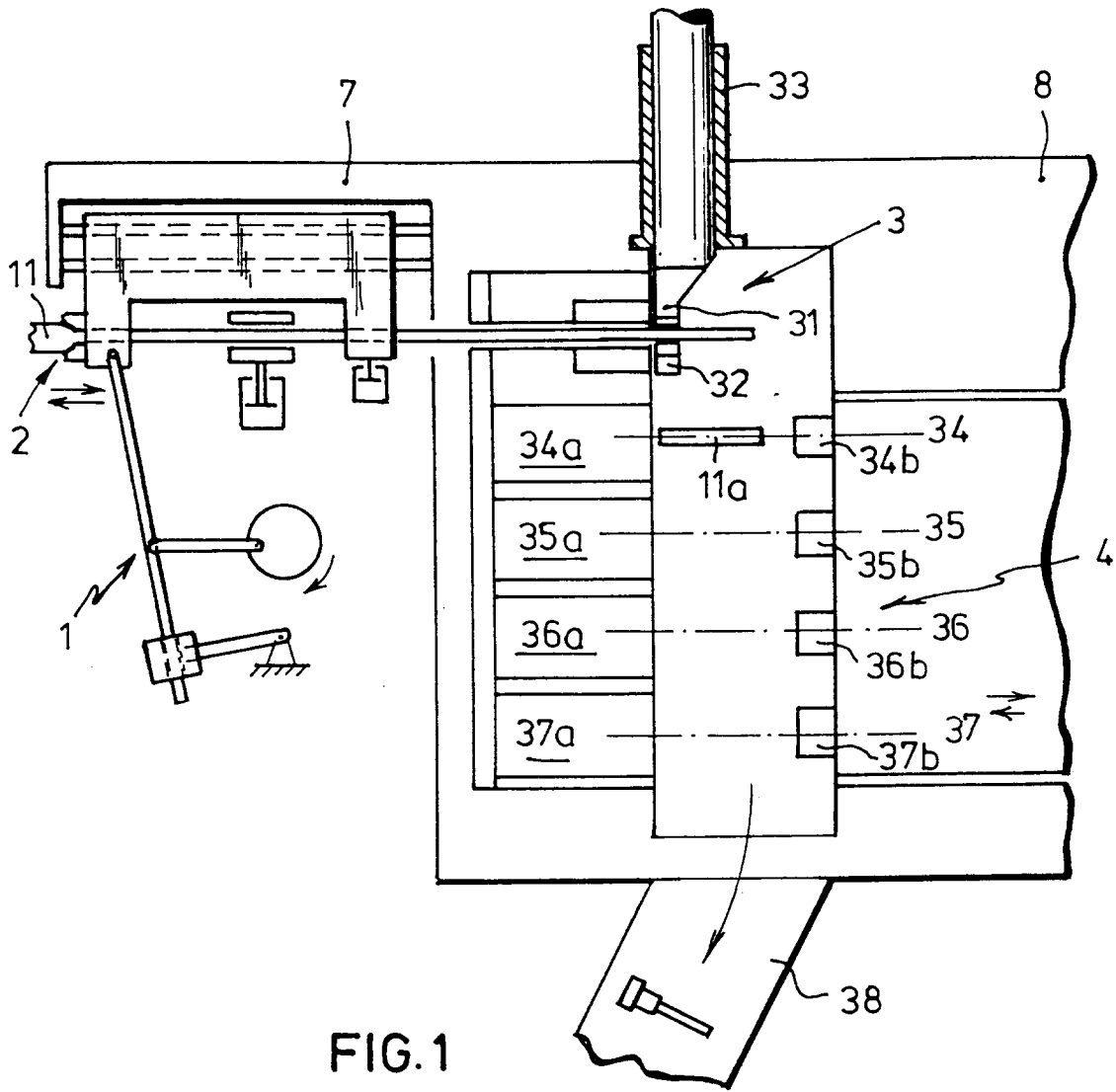


FIG. 1

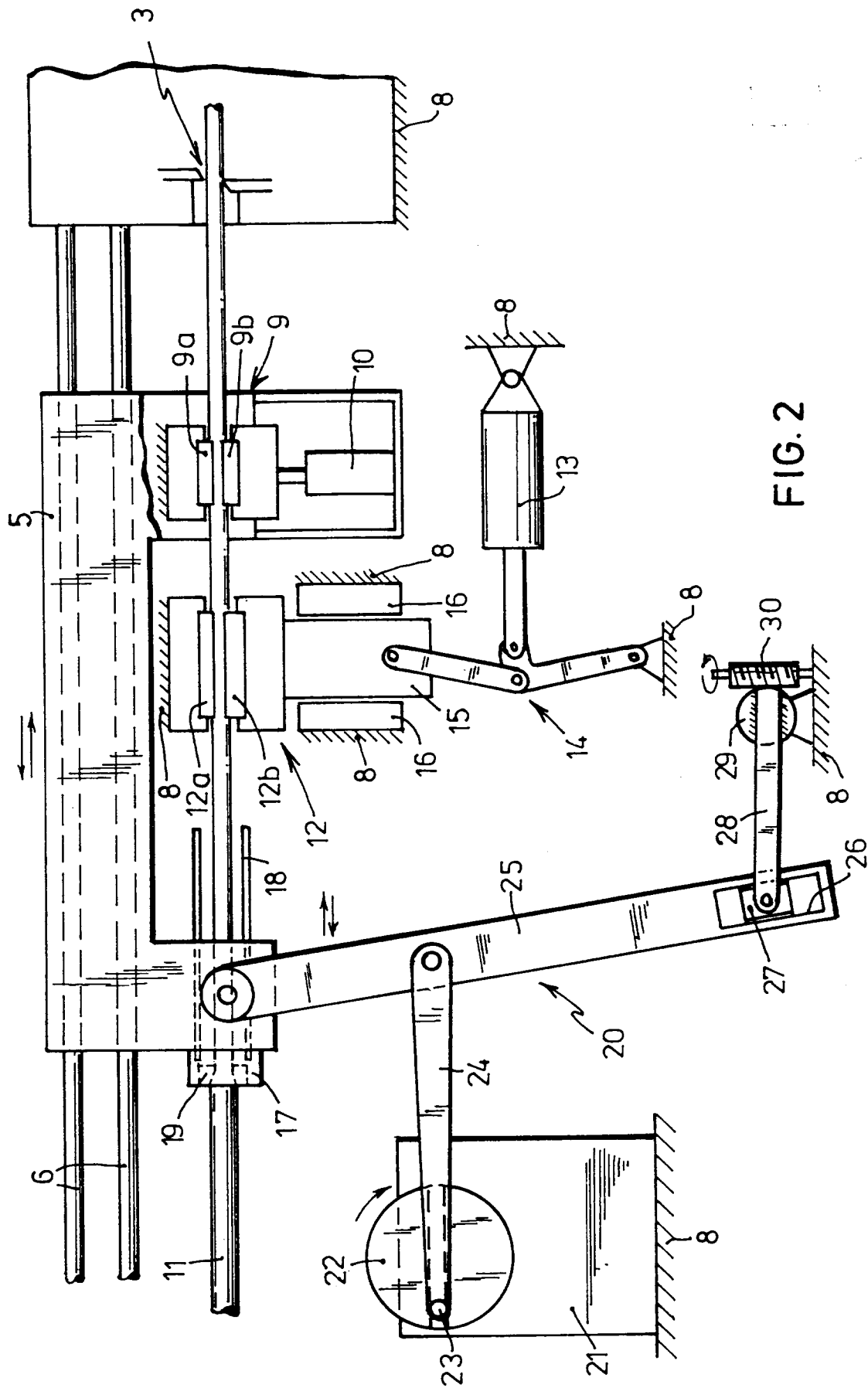


FIG. 2