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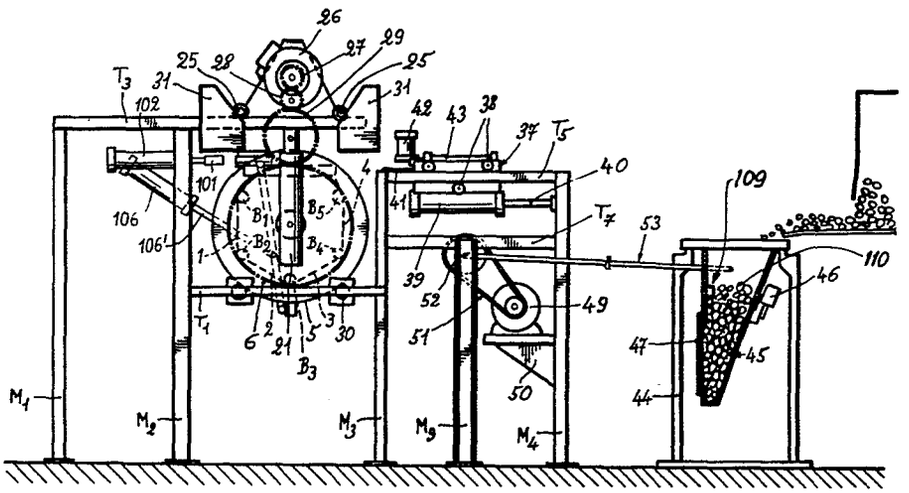
(54) Automatic system of loading and unloading baskets for galvanic baths.

(57) The invention concerns an automatic loading and unloading system for the baskets (1) adapted to hold the charges of workpieces (110) to be treated with galvanic baths. While a control and support assembly provides for supporting the basket during the working cycle comprising loading, transfer, treatment, return and unloading, at the same time driving its rotary motion, the automatic loading and unloading of the basket are effected at a station provided with devices especially designed for these operations, so as to carry out automatically these operations, which hitherto required tiresome manual operations.



EP 0 080 211 A1

"AUTOMATIC SYSTEM OF LOADING AND UNLOADING BASKETS FOR GALVANIC BATHS"

The present invention relates to an automatic system of loading and unloading baskets for galvanic baths, providing an important technical progress in this field, as it solves many problems which hitherto rendered difficult, tiresome and even dangerous these operations.

It is well known that metal articles, and more particularly small articles are subjected to galvanic treatments such as nickeling, zinc-plating, blueing and many other similar treatments, by dipping them into a galvanic bath, closed in special foraminous boxes made of a material which cannot be attacked by the bath compositions, said boxes being rotated within the bath to attain a uniform deposition of the metal solution on the workpieces.

However these containers called baskets, have a number of problems relating to the rotation control, the support and especially their loading and unloading, requiring several tiresome, difficult and even dangerous operations, which were hitherto effected manually by one or more operators.

The present invention solves these problems, eliminating all the drawbacks and disadvantages of the presently available systems, by an ingenious and original assembly

of devices, rendering automatic all the above mentioned operations, attaining levels of performance and precision which were not expected in this industrial field.

The automatic loading and unloading system of the present invention, substantially comprises a frame being the station where the operations are carried out, means for positioning and blocking the basket in the frame, means for releaising the closure devices of the basket lid, means for binding the lid to a pulling carriage movable on the frame, means for opening and closing said lid and means for the volumetric determination of the charge of workpieces in the basket.

Said basket in its turn has a support and control assembly, substantially comprising means for supporting the basket, a motor mounted cantilevered from the support means, actuating a gearing for the basket rotation, and means for recovering wear of said control gearing.

The various features of the elements forming the system of the present invention, together with their considerable and numerous objects and advantages, will be better understood and become apparent from the following detailed description of a preferred embodiment, which is however given only as an example not limiting the scope of the invention, and illustrated in the accompanying drawings, which are also to be considered as explanatory and non limiting visual aids, in which:

Fig. 1 is a plan view of the frame where a basket is to be positioned, in which the devices of the automatic system of the invention are mounted;

Fig. 2 is a plan view of the frame on which the basket is placed, where the device for releasing and opening the lid was actuated;

Fig. 3 is a plan view of the basket alone;

Fig. 4 is a detailed partial side view of the basket lid, with one of the cylinders for locking and opening the lid;

Fig. 5 is a diagrammatic showing of two stages of the basket positioning operation, to arrange horizontally its opening;

Fig. 6 is a lateral elevational view of the control and support frame with the basket positioned on it; and

Fig. 7 is a front elevational view of the system with the basket positioned at the loading and unloading station, where the device for loading the workpieces is shown, provided with the magnetic device for the volumetric determination of the workpiece charge.

With reference now to the various figures of the accompanying drawings, first of all it will be noted that like reference numerals indicate like parts in the various figures, and that all the elements of the frame and of the loading and unloading station, as well as the support elements and the motor will be made of metal, unless another material is explicitly mentioned, while the basket and the gearing controlling its rotation (which are being dipped in the galvanic bath) are generally made of suitable synthetic materials, i.e. plastics which cannot be attacked by acids and oxidation; however it is clear that the choice of the materials is neither binding nor limiting the scope of the invention and for example other antiacid and antioxidant materials could be used for the basket and its control gearing.

The loading and unloading station comprises a frame consisting of several uprights and crosspieces, forming two lateral assemblies where the mechanisms are arranged, acting on the basket coming from the galvanic baths and being placed at the center of the frame between the two lateral assemblies. Generally speaking, the frame comprises vertical uprights M_1, M_2....M_n, longitudinal bars L_1, L_2...L_n and crosspieces T_1, T_2...T_n. One of the lateral assemblies comprises the means for blocking the basket to the frame and the means for releasing the closure devices of the basket lid, while

the other lateral assembly comprises the means for opening and closing the lid and to bind it to a carriage on which said means are mounted, said carriage with its movement removing the lid from the basket and placing it again on the basket, while in the central part of the frame there are the means for the self-centering positioning of the basket on its seat in the frame. On one side of the frame there is the device for loading the basket and for the volumetric determination of the workpiece charge, taking a container for the workpieces through a pair of swinging arms, to a position above the basket placed in the frame, in order to reload it with workpieces.

The basket control and support assembly comprises a sturdy upper beam, to which is attached the hook of the crane carrying the basket to the tanks of the galvanic baths, said beam being provided at both ends with a fork cooperating with the basket positioning means of the frame, and supporting at one side in a cantilevered fashion the motor controlling rotation of the basket through a set of gears meshing with one another and vertically arranged along one of the basket heads, supported by two vertical uprights and comprising also a device for recovering the gearing wear, while the lid has a system of engagement with the basket body, hindering penetration of workpieces in the lid external slots, that would lead soon to bulging and deformation of the lid, which would then have no more a perfect seal with consequent leakage of liquid and loss of workpieces.

This preliminary description of the various assemblies and elements has the purpose to give a general outline of the system, which is now being described in its individual parts, with specific reference to the figures of the accompanying drawings, and therefore it is advisable to start with a description of the basket and its support and control assembly, because it is better to understand well first of all the structure and operation of the basket, since it is on the basket and around it that all the other

devices arranged in the two lateral assemblies of the frame are operating.

Therefore, the structure of the basket may be well understood by making particular reference to Figs. 2, 3, 4, 6 and 7 of the drawings. The basket body has an almost pentagonal form determined by five longitudinal bars B_1, B_2, B_3, B_4 and B_5 as its skeleton, between which the longitudinal faces 1, 2, 3 and 4 of foraminous material for the circulation of the bath liquids are extending. The two basket heads are different, as the head where the basket rotation control is arranged, consists of an outer template 5 with a toothed disc 6 being the last gear of the driving train starting from the motor, while the opposite head consists of a simple closure disc 7.

A particular attention should be given to the lid C of the basket, as the lid has a number of features playing a fundamental role in the system operation. First of all it is to be noted that the longitudinal lips of the basket mouth are different for obtaining a perfect seal of the closed lid, namely the closure or receiving lip 8 has a recess 9 where the front edge 10 of lid C is lodged, while the opposite lip 11, at which side the lid C is removed or placed, has an outer projection 12, on which the rear edge 13 of said lid is inserted, said rear edge 13 having a recess with a shape perfectly complementary to the outer projection 12.

In this way, with a perfect seal of the closed lid along its edges, the risk of penetration of workpieces under the lid edge is avoided, that with time and build-up would cause bulging and permanent deformation of said lip.

In the lid thickness there are long dead holes 14 for the insertion of three pins (to be described hereinafter) to bind the lid during the opening and closing stages. Furthermore the lid is provided on its upper surface with a projecting block 16 near the extraction side of the lid, acting as a shoulder for the closure stroke of the lid, while near its closure side there is the lid closure device, consisting of pincers 17

elastically urged to the open position and swinging on their pivots 18, but held closed by stop blocks 20.

The basket is supported by two vertical uprights 21, which are connected to the basket support telescopically, i.e. through a spring-loaded part 22 sliding inside them, the basket support being formed by an upper horizontal beam 23 having at each end a fork 24 provided with cylindrical pins 25 for selfcentering the assembly, as it will be apparent hereinafter.

On one side the beam 23 supports in a cantilevered way the motor 26 controlling the basket rotation through a set of gears 27, 28 and 29, the latter meshing with the toothed disc 6 of the basket. As these gears, which are made of plastics like the basket in view of their dipping into the galvanic baths, undergo a certain wear, the telescopic connection between uprights 21 and beam 23 accomodates the progressive wear of said gears, keeping the lower gear 29 always meshing with the toothed disc 6. The cantilevered arrangement of the motor 26 outside the basket is very useful, as it avoids that the motor is directly attacked by the bath vapours, when basket is dipped into it.

Having thus described the basket and its control and support assembly, it is now possible to describe its positioning at the center of the loading and unloading system. The central vertical uprights M_2, M_3, M_6, M_7 of the frame have central intermediate crosspieces T_1 and T_2 supporting in a cantilevered way idle rollers 30 on which the basket is placed and can roll, so that the basket is safely positioned in the frame always at the same height in alignment with the devices for opening and closing the lid as provided by the system. Furthermore the upper crosspieces T_3 and T_4 have trapezoidal plates 31 forming a self-centering saddle, on which are laying the cylindrical pins 25 of the forks 24 of the support beam 23 of the basket which is going

to be placed exactly in a central position in the frame.

The frame lateral assembly on the said of closure of the lid (top portion of Figs. 1-2 and left side of Fig. 7) comprises a single concave wedge 101 controlled by a pneumatic or oil-hydraulic piston 102, adapted to effect closure of pincers 17 of the lid C and then opening of said lid during the pushing stage simply using the sliding on the two oblique planes 103 of said wedye 101.

With reference now to Fig. 5, the basket positioning is effected by a piston 106 which through rod 106' pushes an arm 107 upwardly hinged at X with respect to the center Y of the basket rotation, so that its contact point during rotation is tangent to the basket vertical axis. On the outer disc 7 of the basket 6 there is a stop 108 that in any position acts as a push point during basket rotation.

The frame lateral assembly on the other side of the system (bottom position of Figs. 1-2 and right side of Fig. 7) comprises a carriage 37, sliding on the upper lateral crosspieces T_5 and T_6 through rolling bearings 38 and movable toward and away from the basket through a pneumatic cylinder 39 whose piston rod 40 is fixed to the longitudinal bar L_4 of the frame. This carriage 37 is provided at the front edge with three pins 41, which are going to enter the dead holes 14 of the lid, and two vertical pneumatic cylinders 42 whose piston rods are locking the lid C during the opening and closure stages, non in a determined position but simply striking on its outer surface, finding a shoulder for pulling the lid during the opening stage in the stop blocks 104.

Referring to Fig. 2 it is to be noted that, after having advanced the carriage 37 to insert pins 41 into the lid C, the locking pistons 42 are positioned for its opening and the concave wedge 101, pushed by rod 105 of piston 102, closes again the pincers 17 and moves the lid until it rests against said carriage, which then is withdrawn and opens the basket lid. Finally the carriage 37 is provided with a further pneumatic

cylinder 39 (see Fig. 7), whose piston rod moves the projecting block 16 during the lid closure stage.

The system of the present invention is completed by an automatic ancillary device loading the basket with volumetric determination of the charge of workpieces. Such a device comprises a frame 44 for receiving a basin 45 having the shape of a funnel with top opening, provided with a vibrator 46 and a discharge door 47. The basin 45 is also provided with a device for the volumetric determination of the charge, interupting the feed of workpieces to basin 45 when the preset volume is reached. With reference to Fig. 6, such volume is determined by measuring the charge level in the basin 45 with one or more magnetic sensors 109, placed inside the basin 45 at fixed positions. Thus, when the workpieces to be processed are loaded in the basin 45 coming from a suitable hopper (not shown), as soon as the sensor 109 are touched by the workpieces 110 reaching their level, they stop the feed through a suitable electronic circuit and cause the basket loading operations and therefore the galvanic processing cycle to be started. As this point indeed the motor 49 mounted on a bracket 50, by means of the drive 51 controla the rotation of axle 52, supported at its ends by the auxiliary uprights M_9 and M_{10} fixed to the lower lateral crosspieces T_7 and T_8, and consequently also the rotation of arms 53 raising the basin 45 and moving it to a position above the basket placed in the frame; at this point a limit switch causes opening of door 47 which discharges the charge of the basin 45 into the basket which is thus recharged with fresh workpieces to be processed.

Having thus completely described the structure of the system of the present invention, the various operations will be described, occurring when a basket filled with workpieces already processed in the galvanic baths arrives on the frame. The inoperative position of the various devices of the frame is clearly shown in Fig. 1,

where the frame is empty, and in Fig. 2 where a basket is placed in the frame.

At its arrival the basket is being self-centered, as already stated, by the saddle consisting of the plates 31 (like saddles will also be provided on the processing and cleansing tanks) and resting on the rollers 30 aligning the basket to the various devices of the frame.

At this point the pneumatic cylinder 39 moves the carriage 37 toward the basket, causing partial insertion of pins 41 in the holes 14 of the lid, which is thus positioned for the subsequent operations, while piston 106 blocks the basket in a vertical position.

The cylinder 102 pushes with its rod the block 101 and therefore the lid in its release position, in preparation to the complete opening of said lid (Fig. 2); this movement at the same time causes the complete insertion of pins 41 into holes 14 so that the lid is now in contact with carriage 37 and the vertical cylinders 42 push their rods against the lid surface, wholly locking it to the carriage.

It is now possible to proceed to the final stage of complete lid opening, by reversing the stroke of piston of cylinder 39, pulling backwards the carriage 37 together with the lid which is now being wholly detached from the basket, which is now open and free to effect a slow complete revolution under the drive of its own motor, so as to be overturned and to discharge its contents of already processed workpieces in a suitable container or on a conveeyor belt (not shown).

When the now empty basket returns to its starting position with the opening arranged upwardly, the cylinder 106 locks it again and the basket may now be refilled with a new charge of workpieces to be processed, by means of the loading basin 45 loaded at the correct level with the intervention of the above described device for the volumetric determination of the charge.

Once the new loading of the basket is complete, the lid is now being closed, first by

returning the carriage 37 toward the basket under the action of cylinder 39, then after withdrawal of the rods of cylinder 42, actuating cylinder 43, whose piston rod pushes the projecting block 16 and therefore the lid until pincers 17 are snap inserted and locked behind the stop blocks 20. The lid is now closed and carriage 37 is now moved again backwards, piston rod of cylinder 43 and of cylinder 102 are withdrawn, so that the basket is now closed, free and loaded, ready for being raised by the crane and taken to the galvanic baths.

Both structure and operation of the system according to the present invention were now wholly described in detail, and its numerous advantages and particular features were highlighted, but once more it is to be understood that what described and illustrated in the accompanying drawings was given as a non limiting example only, and that several variations, modifications, additions and/or substitutions of elements may be resorted to the system, without departing however from its spirit and scope, as it is also clearly stated in the appended claims.

CLAIMS

1) Automatic system of loading and unloading baskets for galvanic baths, characterized by the fact of substantially comprising a frame (M, L, T) being the station where the operations are carried out, means for positioning (30, 31) and blocking (106, 107) the basket in the frame, means (101) for releasing the closure devices (17) of the basket lid (C), means (41, 42) for binding the lid (C) to a pulling carriage (37) movable on the frame, means for opening (39) and closing (43) said lid (C) and means (109) for the volumetric determination of the charge of workpieces (110) in the basket, all said means being moved in a predetermined sequence adapted to carry out the complete cycle of loading and unloading the workpieces to and from the basket.

2) System according to Claim 1, characterized by the fact the means (30, 31) for positioning the basket in the frame comprise a saddle at the two basket heads (5, 7), consisting of cradle inclined plates (31) to bring the basket support to a central position, said basket laying on idle rollers (30) supported by frame fixed parts (T_1, T_2).

3) System according to Claim 1, characterized by the fact that the means (106, 107) for blocking the basket in the frame with the lid (C) in a horizontal position comprise a cylinder (106) moving a rod (106'), the rotation pin of which is offset in respect of the basket rotation center, while at the opposite side of the rod there is a shoulder (107) defining a radius tangent to the lower vertical axis of the basket, which is at right angles with the lid (C) and finds a stop (108) on said basket so as to bring it to the exact rest position.

4) System according to Claim 1, characterized by the fact that the means (101) for releasing the closure devices (17) of the basket lid (C) consist of a concave wedge (101) which, being pushed by pneumatic or hydraulic piston (102), closes the closure pincers (17) effecting their release from the corresponding stop (20) so as to obtain the initial

lid opening stage.

5) System according to Claim 1, characterized by the fact that the means (41, 42) for binding the lid (C) to the pulling carriage (37) consist of three dead holes (14) made in the lid thickness, in which are introduced corresponding pins (41) projecting forward from the carriage (37), as well as a pair of vertical cylinders (42) arranged in a cantilevered way on said carriage (37) so that their piston rods are contacting the lid plane and are engaged during opening stage by stop blocks (104) on said plane.

6) System according to Claim 1, characterized by the fact that the means (39) for opening the lid (C) consist of the same cylinder (39) which moves the carriage (37) and removes it from the basket together with the lid (C) bound thereto, while the means (43) for closing the lid, in addition to said cylinder (39) in its reverse stroke, consist of a further overlying and parallel cylinder (43), pushing a stop block (16) applied on the lid upper surface, so as to move the lid until its pincers (17) are inserted and snap blocked behind stops (20) provided on the basket opening mouth.

7) System according to one or more of the preceding claims, characterized by the fact that the basket lid (C) has its edges provided with members (10, 13) for a groove-and-tongue joint with the basket opening (9, 12), so as to avoid penetration of workpieces in the edge.

8) System according to one or more of the preceding claims, characterized by the fact that the basket is supported by two lateral telescopic uprights (21, 22) to slidingly recover wear of the gearing (27, 28, 29) transmitting the rotary motion to the basket.

9) System according to Claim 8, characterized by the fact that the gears (27, 28, 29) of said transmission gearing are arranged in a vertical row along one basket head (5), starting from a motor (26) supported in a cantilevered fashion outside the basket supporting frame (21, 23).

10) System according to Claims 2 and 9, characterized by the fact that the basket supporting frame (21, 23) comprises an upper horizontal beam (23), provided with two end forks (24) having cylindrical pins (25), adapted to center the basket by sliding on inclined planes of the frame centering saddle or cradle (31).

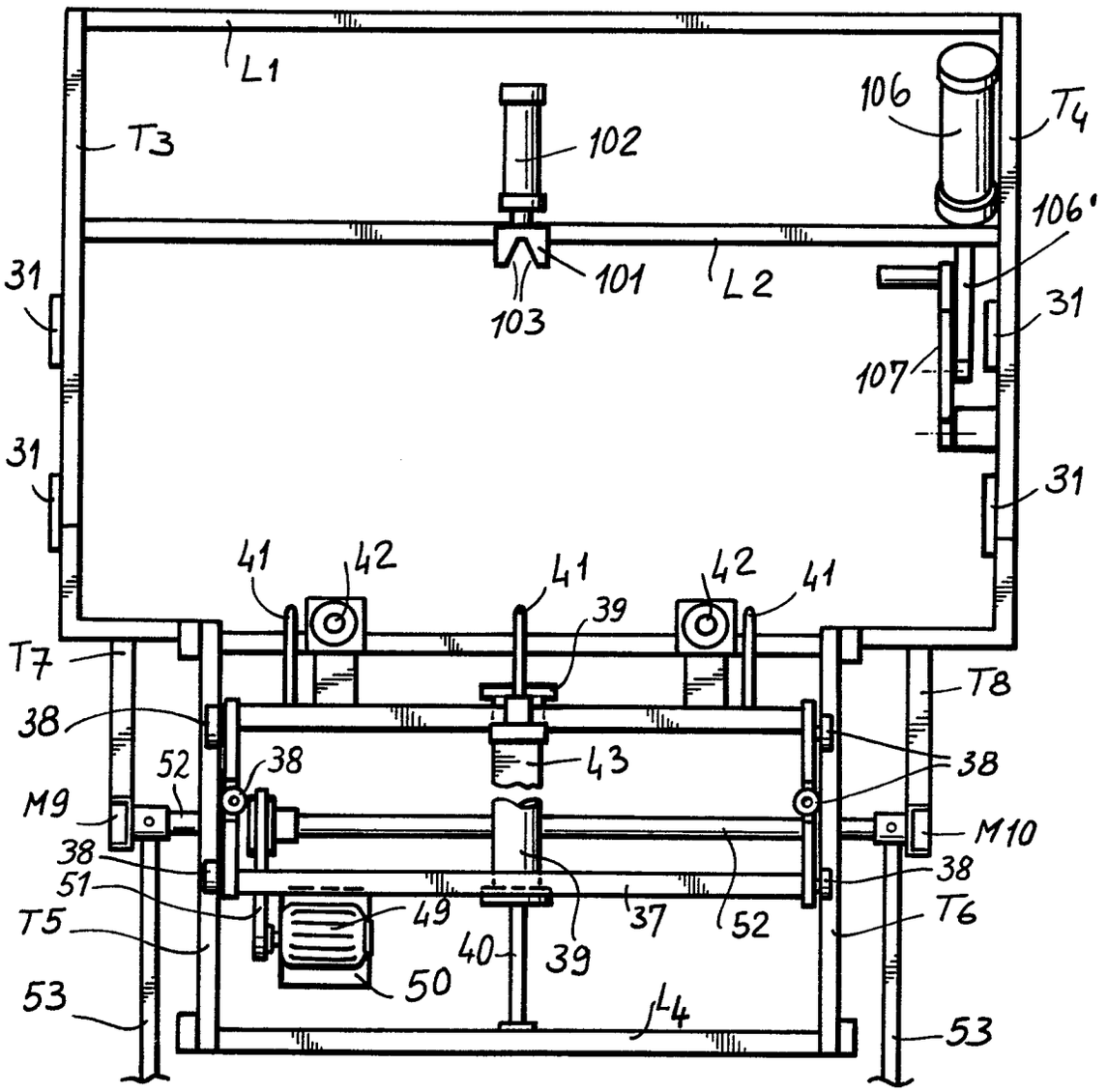
11) System according to Claim 1, characterized by the fact that the means (109) for the volumetric determination of the basket charge consist of a set of magnetic sensors (109) provided with a suitable electronic circuit, signalling the predetermined level of workpieces (110) reached in a suitable loading container (45), and stopping the feed to said container (45), which is provided with a device consisting of swinging arms (53) taking the container (45) up to a position overlying the open basket placed in the frame, so as to discharge the charge of workpieces (110) into said basket.

12) System according to Claim 1, characterized by the fact that the container (45) has the shape of a funnel with open top mouth and a bottom discharge door (47), said container (45) being preferably provided also with a vibrator (46).

13) System according to Claim 9, characterized by the fact that the last gear of the gearing set consists of a toothed disc (6) fixed to a template (5) forming one of the basket heads and resting on said frame idle rollers (30).

14) System according to one or more of the preceding claims, characterized by the fact that the basket, its lid and the gearing transmitting the motion to said basket are made of a synthetic material which cannot be attacked by acids, oxides and any other corrosive agent present in the galvanic baths.

Fig. 1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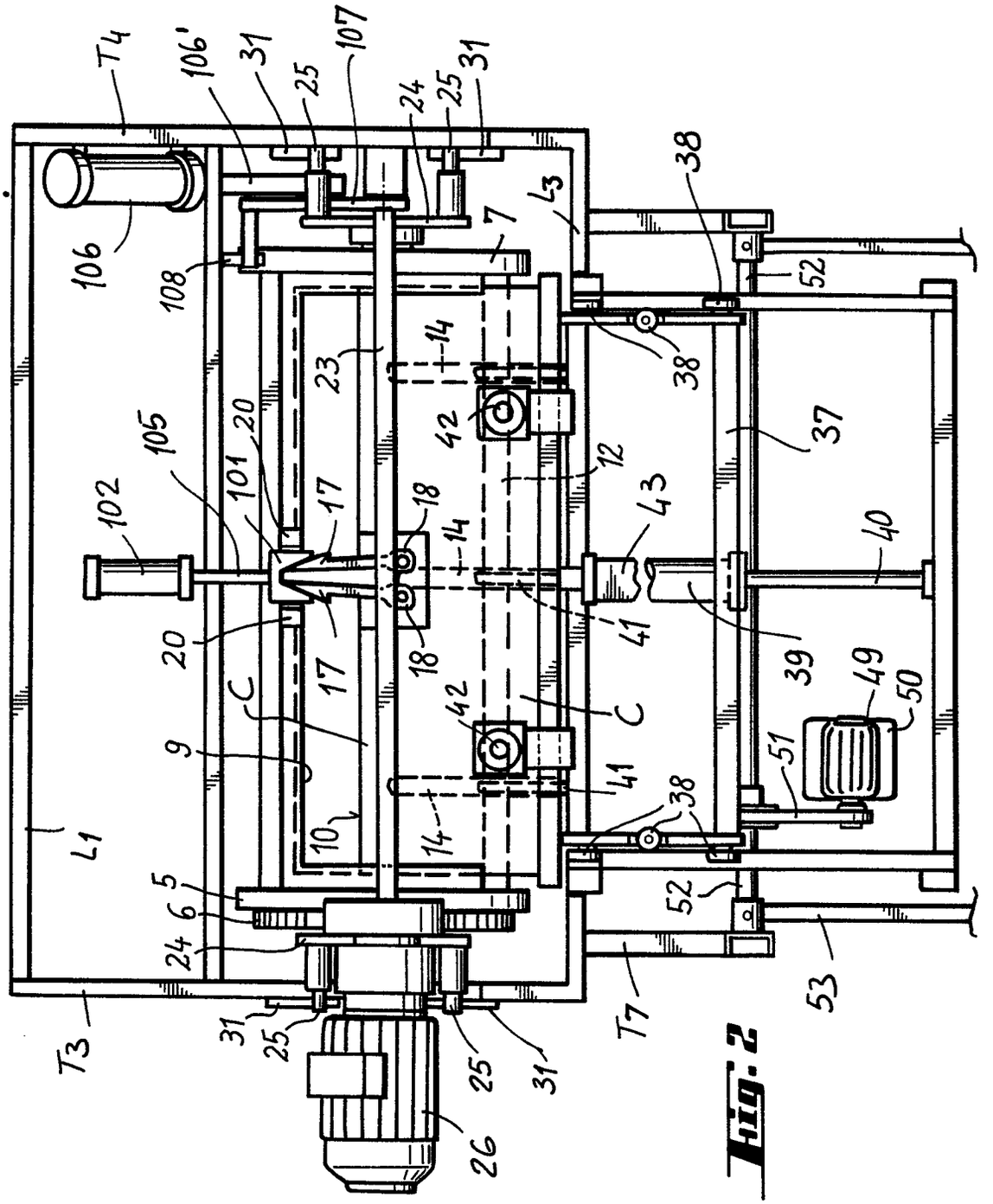

Fig. 2

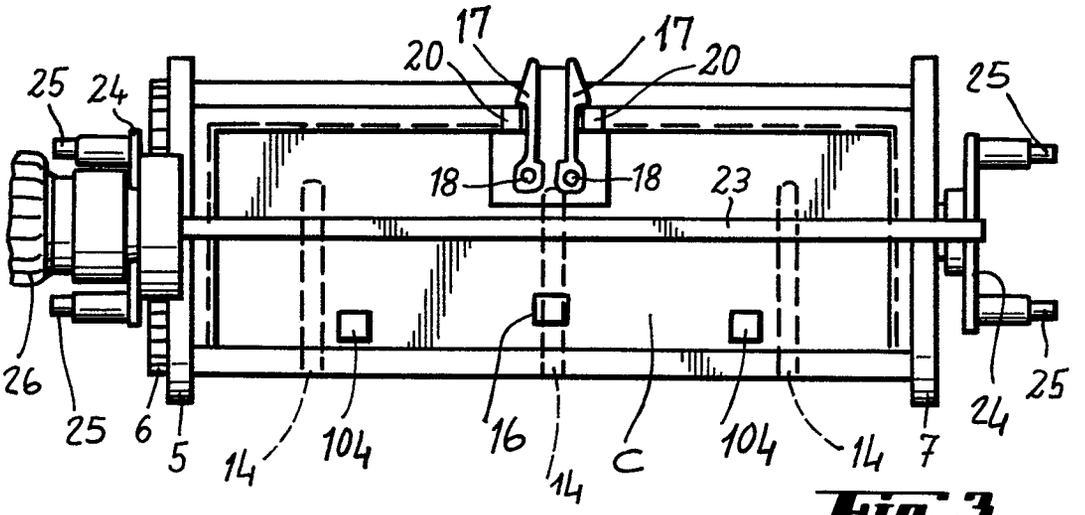

Fig. 3

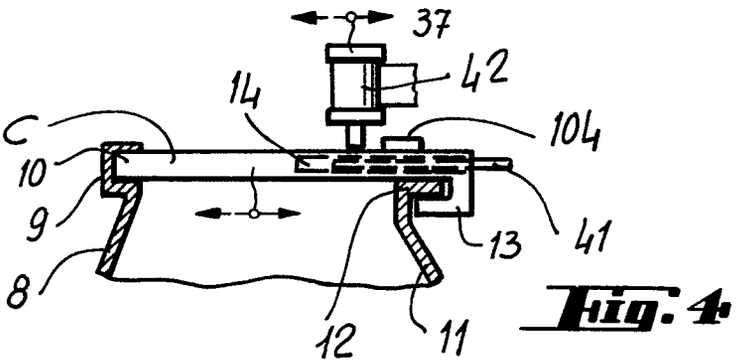

Fig. 4

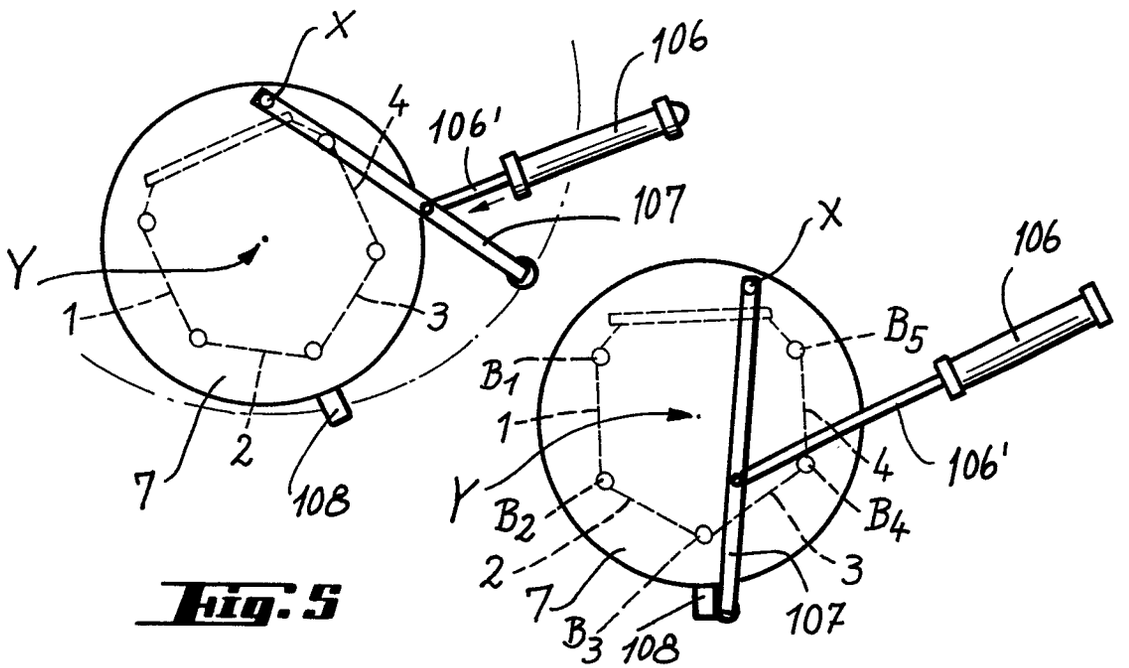

Fig. 5

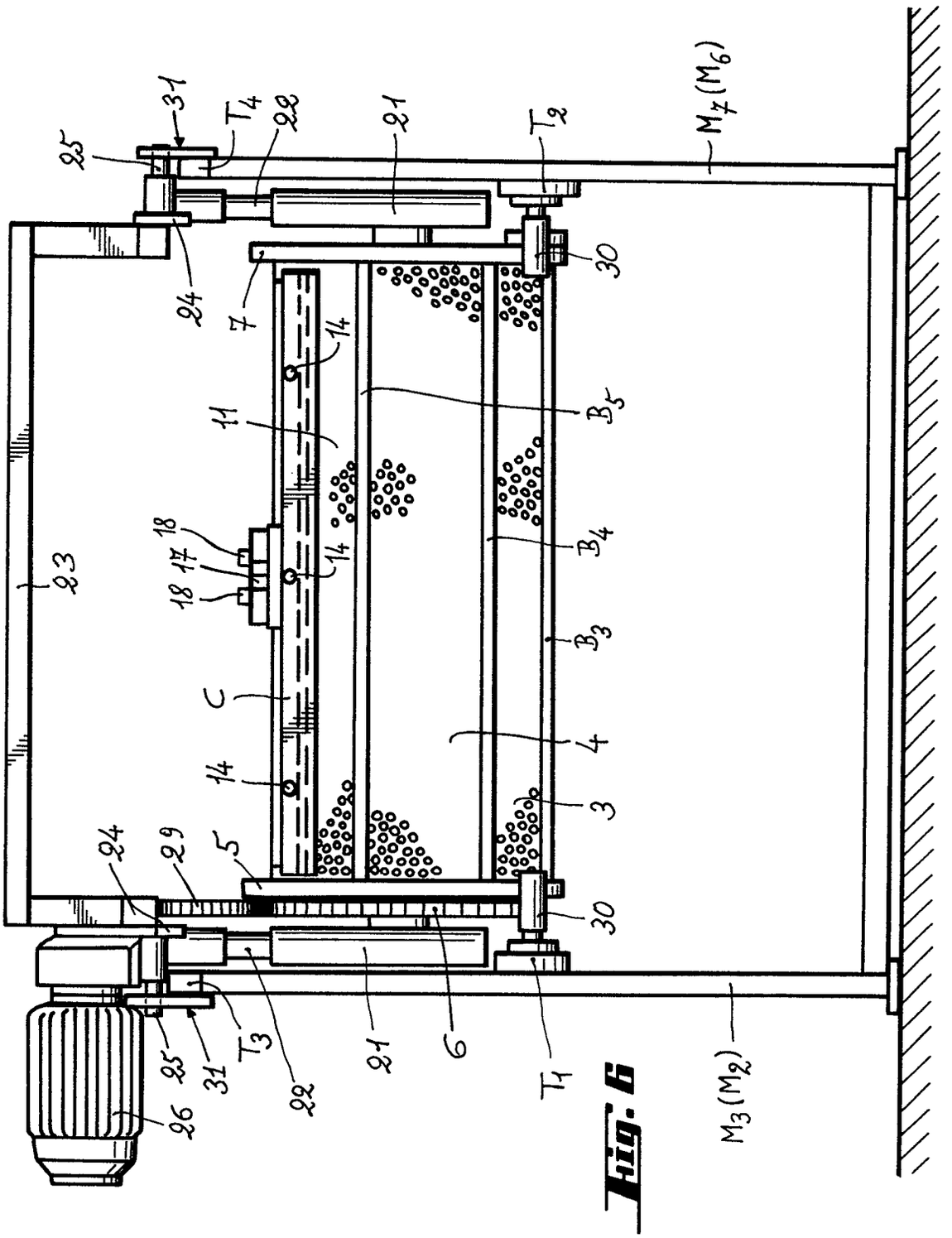
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Fig. 6

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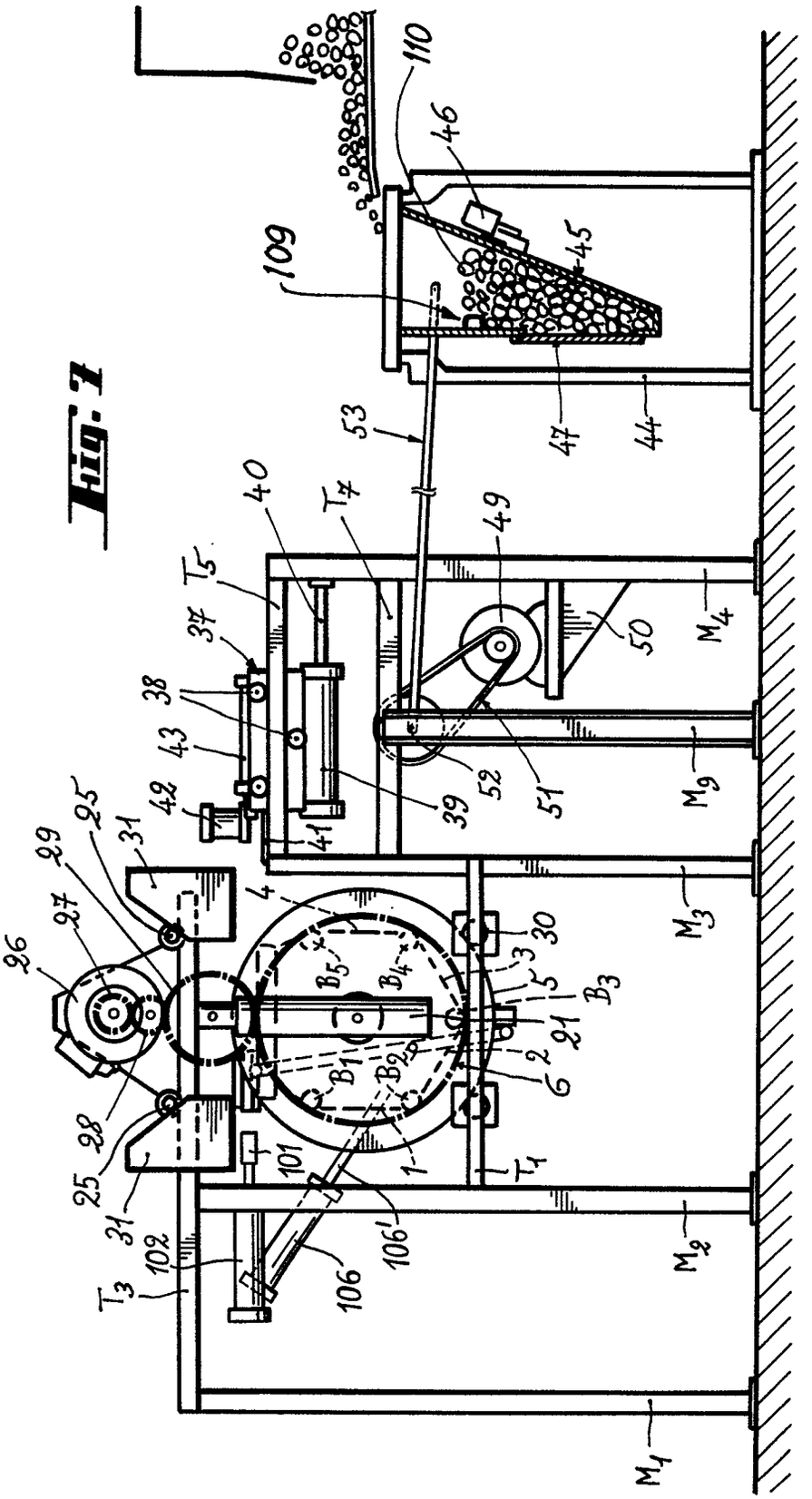
Fig. 1



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EUROPEAN SEARCH REPORT

0080211
Application number

EP 82 11 0877

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	DE-A-2 704 568 (UPO OSAKEYHTIO) *Page 2, claim 11*	1	C 25 D 17/20
X	US-A-2 941 656 (JACKSON) *Column 3, lines 72-76*	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			C 25 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09-02-1983	NGUYEN THE NGHIEP

CATEGORY OF CITED DOCUMENTS

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