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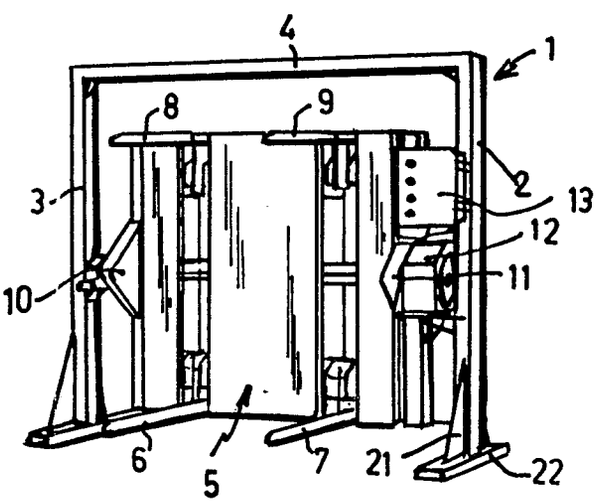
(54) Turning over machine.

(57) Turning-over machine comprising a support (1) and an object clamping frame (5) rotatable around a horizontal axis in the support. The centre of gravity of the frame carrying an object is located at the other side of the axis of rotation as the centre of gravity of the empty frame. Means can be provided to move the centre of gravity of the frame in such a way that the frame turns over under the influence of gravity.



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TURNING OVER MACHINE

The invention relates to a turning over machine, substantially comprising a support and a frame rotatable round a horizontal axis of rotation in said support, which frame is provided with guides for spoons which can be moved towards and away from each other, whereby an object such as a pile of paper can be clamped between the spoons and can be turned over by rotation of the frame.

Such pile turning over machines are known in many embodiments and serve amongst others to turn over big and heavy piles of paper with sheets. In a printing office the sheets are being taken off by a printing press from an inlay pile one at a time, inserted in the press and layed down on a pile when printed. The requirements of the inlay pile are: that the pile is positioned on a pallet in such a way that it is precisely perpendicular to and positioned at the edge of the carrying pallet when it is delivered to the machine, so that the pile is positioned between and against guide rods. Only small tolerances can be handled by the machine itself.

Further the paper that has to be printed at the rear side must be turned over. That means that paper delivered on pallets by the factory has to be piled up again, precisely at right angles and directed sometimes on an inlay plate, especially adapted for a certain machine, in such a way that it satisfies the tolerance

for the inlay device.

The sheets can have dimensions of 70 by 100 cm and are usually delivered in a height of 100 cm. It is also possible that larger dimensions and amounts are concerned and it takes much force and time to turn this over by hand. In the past this was done by a skilled labourer, who was mostly present at the printing presses, but one can imagine that this gives many complaints about the back.

Machines are therefore concerned which can efficiently turn over piles which are at least of the magnitude of about 1500 kg.

One can make use of a pile turning over machine which substantially comprises a cylinder positioned on rolls, but this machine has the disadvantage that there must be platform, and it is very cumbrous to run the piles of paper safely up that platform and to run them off again after turning. It is not realistic to suppose that such a machine could be positioned in a recess in the floor, because in view of the fast development of the technics a new arrangement of machines is often required in printing offices.

A known machine which does not have to be positioned on a platform, has as most important disadvantage that a drive with high capacity is necessary to turn the frame with the belonging pile of paper. Usually electro motors are used and it therefore is necessary to mount a large transmission between the motor and the frame and this has a very unfavourable influence on the initial expenses of such a machine. Current electro motors have a number of revolutions of 750 to 800 per minute, while the frame preferably turns round in 1 minute; one has to have an expensive double worm box or a single worm box with a normal reduction box.

The known machines often have the disadvantage that the minimal

clamping height between the spoons is so big, that filling means such as card boards or even pallets are necessary to turn a rather small pile by machine. A minimal pile height of about 50 cm must be considered as the desired top limit, other wise there will rise back complaints with the helping skilled labourers again.

The invention tries to improve the foregoing.

According to the invention this is accomplished, because the centre of gravity of the frame with the pile is just at the other side of the horizontal axis of rotation as the centre of gravity of the frame without pile. This gives a considerable reduction of the necessary power and therefore also of the initial expenses for the transmission means. It however appears to be possible to leave said driving means totally away. This is accomplished by the characterizing feature, that the centre of gravity of frame with or without the pile is movable, with respect to the axis of rotation in such a way that the frame turnes under the influence of the gravity.

A preferably used embodiment of the invented pile turning over machine has the characteristic, that at both sides of the machine an arm is positioned between the frame and the support, in which a worm is positioned, both worms being synchronously drivable and which can move the frame with respect to the support by rotating in a fixed nut.

With such a machine the spoons can be mounted in spoon carrying plates which are movable towards and away from each other because they are guided in U-profiles by rolls and because they are connected by rods to a rotatable worm with left and right hand screw thread, which is solidly positioned on the frame.

With this embodiment two rolls are mounted at each end of the rod, from which the outer one can each time extend out of the U-profile in the most outwardly moved position of the spoons. This feature has been made to assure that the spoons can extend out of the frame far enough to touch the floor, but on the other hand the frame has such a restricted height that the turning is not hindered.

To be able to use the above in practice it can be necessary that houses with narrowed throat section are mounted on the spoon carrying plates.

An other possible embodiment has the characteristic, that the spoon carrying plates are mounted on jib arms which can be moved towards and away from each other because they are guided in U-profiles with rolls, said jib arms bridging the distances between the rear walls and the point of rotation of the frame, and which jib arms can be driven by worms with left and right screw thread, solidly positioned on the frame. By using this feature a relatively low construction height is possible. As interesting detail of this embodiment can be mentioned, that the spoon carrying plates are provided with guide strips, at the sides turned towards the object, which strips can slide over guide strips of the rear walls, which are turned away from the object, which are only attached to the arms close to the centre by tubes.

It is useful to position the spoons on the axis and to let them be movable over a short distance parallel to themselves, because thereby the spoons can be adjusted to the position of the spoons of a fork lift truck which is driven in front or to the position of the pallet parts which are positioned on said spoons.

It is also useful to provide the support and the frame with abutments to restrict the rotation of the frame to substantially

180°.

Also a brake device can be mounted which for example comprises of a cam disc provided on the arms and which disc is provided with recesses for the load and unload positions and a protrussion to let the unstable balance position pass.

The invention will be further elucidated hereunder, according to the drawing, in which three embodiments of a machine according to the invention are shown as an example.

The drawing shows:

Fig. 1 in perspective the most simple embodiment of the invention with the spoons towards the spectator.

Fig. 2 the same as in fig. 1, but the frame is turned about 90°.

Fig. 3 the same as in fig. 1 but with the spoons away from the spectator, so with the frame turned over almost 180°.

Fig. 4 a side view of an embodiment to which no motor drive is necessary to turn the frame.

Fig. 5 the same as in fig. 4 but with the spoons moved towards each other and the frame moved to the left with respect to fig. 4.

Fig. 6 a view in the direction of the arrow VI of fig. 4 however with both spoons in the upper position, which is not so in practice.

Fig. 7 a detail of the fastening of the rods of the spoon carrying plates, that is, a section according to the line VII-VII.

Fig. 8 a section according to the line VIII-VIII of fig. 7 for elucidating houses with narrowed throat section.

Fig. 9 a view of an other embodiment opposed to fig. 6 and with both spoon carrying plates in the position which is possible in practice.

Fig. 10 a side view of the spoons and an arm and a U-profile as used in the embodiment in fig. 9 with a cam disc for the brake device, on a larger scale next to this.

Fig. 11 a top view of the arms, and

Fig. 12 a top view of the spoons which cooperate with the arms of fig. 11.

In fig. 1-3 a pile turning over machine is shown which is constructed with a support 1 comprising uprights 2 and 3 and a bar 4, and with a frame 5 which can be turned within the support 1. The uprights 2 and 3 are connected to bottom plates 22 by reinforcements 21. The frame 5 has four spoons 6-9 which can be moved towards and away from each other parallel to themselves in a way which is to be further elucidated. When they are moving towards each other they can clamp a pile of paper, supplied by for example a fork lift truck (not shown), which is put on the spoons 6 and 7, between them.

The frame 5 is connected to the axis of rotation by arms 10 and 11, while the drive is done by a motor 12. The switching means thereto are housed in a box 13.

The special thing to this first embodiment is that the point of gravity of the frame, which is not loaded with a pile of paper, is positioned in fig. 1 behind the plane of support 1; for there are

the largest amount of parts of the frame including the parts, which still have to be discussed, for moving the spoons towards and away from each other. After positioning the pile of paper the gravity of the mass which is to be turned will go to the other side of the plane through the support. This assures that the electro motor 12 can be a motor with a rather small capacity, while also the favourable load of the arms 10 and 11 has the effect that these can be less heavily dimensionated.

Fig. 2 shows the machine with the frame turned over 90°; the spoons 6-9 are almost vertical. In order to get the pile of paper neatly on the frame, the spoons can be temporarily moved away from each other over a small distance.

Fig. 3 shows the machine with the frame turned over alsmost 180°, now the rear side can be clearly seen. There the electro motor 14 is positioned which serves to move large bars 17-20 up and down along rods 15 and 16, to which spoons are mounted at the side which is facing away from the spectator in fig. 3. Therefore a worm (not shown) has been inserted in the tube 35.

Such a pile turning over machine works satisfying, but is still rather heavy and expensive, amongst others because of the necessity of using a reduction box with a large transmission ratio between the electro motor 12 and the arm 11. Also the large rods 15 and 16 and the belonging bars 17-20 have a slight unfavourable influence on the initial expences of the concerning machine.

These relative disadvantages do not occur with the pile turning over machine from which the principles will be described hereunder according to the fig. 4-8. When it concerns parts which are identic to the parts of the machine of fig. 1-3, the same reference numerals will be used.

The pile turning over machine shown in fig. 4-6 is constructed with a support 1 comprising two uprights 2 and 3, each being connected to bottom plates 22 by reinforcements 21. The frame 5 has again four spoons 6-9 which can be moved towards and away from each other parallel to themselves in a way which is to be further elucidated.

The special feature of the embodiment of fig. 4-6 is, that the frame 5 can be moved with respect to the uprights 2 and 3, because of which the frame can move itself from the position of fig. 4 to that of fig. 5. This is possible, because the arms comprise of hollow tubes in which a worm 23 can be rotated by a motor 24 in a nut 25 which is solidly connected to the shafts 26 which are rotatably supported in the uprights. In order to assure the straight guiding of the frame both worms 23 must be driven of course with the same speed and for straight guiding both arms guiding plates 27 carrying the rolls 28 are provided. In the drawing both worms 23 are driven by an own motor, but it is of course also possible to use one motor and to drive the other worm by a chain transmission.

It may be clear, that when a pile of paper is delivered to the spoons 6 and 7 by a fork lift truck (not shown), this pile will be clamped between the spoons 6-9, and subsequently the worms 23 are rotated in such a way that the frame moves itself from the position of fig. 4 to that of fig. 5, the mutual point of gravity of the frame and pile of paper will at a certain moment come to the left of shaft 26 in fig. 4 in the drawing. The frame which has been restricted in its rotation by abutments 29 on auxiliary arms 30 and abutments 31 on the uprights 2 and 3, will now turn in a direction opposed to the movement of the hands of a clock in fig. 4 and 5. As soon as the angle of rotation of 90^{o} has been passed, the mutual point of gravity will again be at the right of the shaft 26 and the rotation would be restricted, but when one

drives the worms 23 in opposite direction, the mutual point of gravity can be transferred so far that it will again come to the left of the shaft 26, so that the rotation is continued. Staggered positioned abutments 32 and 33 on respectively the auxiliary arms 30 and uprights 1 and 2 take care that finally the rotation is restricted to 180°. The pile of paper is turned over now and can be removed from the machine again.

Now that the frame 5 can be moved that far with respect to the shaft 26, the problem occurs that the frame always could pass the floor with its arms 10. This requirement is in contradiction with the desire to let the spoons come as close as possible to the floor when placing and removing piles of paper. For this desire the frame has to have a height which comes as close as possible to the maximal height between the poons with respect to the guiding.

This problem has been solved as follows. The frame 5 of the embodiment of fig. 5-6 comprises two U-profiles 34 facing each other which are connected in the middle by a horizontal U-profile 35 (fig. 6), wherein a worm 36 is positioned which is driven by a motor 37. The worm 36 has worm portions 36a and 36b which have an opposite pitch and on this parts nuts 38 respectively 39 are positioned which are rotatably connected to each time two rods 40, 41 respectively 42, 43 which are at their free end rotatably connected to the spoon carrying plates 44 and 45 (fig. 6). It is remarked, that in fig. 6 the lower spoon carrying plate 44 and the belonging rods 40 and 42 are drawn dotted in the smallest paper pile clamping position, while the in the drawing top spoon carrying plate 45 and belonging rods 41 and 43 are drawn in the maximal opened position which corresponds to the position of fig. 4.

The spoon carrying plates 44 and 45 each have two rolls 47 at both ends, which can ride in the U-profiles 34 which are facing each other. The construction is now such that the outer rolls can each time extend out of the U-profiles 34 in the maximal opened positions. This speciality will be further elucidated by fig. 6-8.

The turning point 48 of the end of the rod 41 which is facing away from the nut 48 is inserted in a house 49 with a throat section which guides the rod to its most perpendicular position in the proper way. This throat section is delimited by ribs 50 (vide also fig. 6); the protruding of the outer rolls 47 out of the U-profiles 34 does not give problems any more by this provision and it will be clear that the spoons 6-9 can be moved so far away from each other by switching on the motor 37 in one or the other direction of rotation, that the spoons 6/7 or 8/9 can touch the floor, respectively that they can be moved so far towards each other, that also relative small piles can be clamped.

It is also remarked, that the spoons are slidable on shafts 51 of the spoon carrying plates 44 and 45, so that they can easily be pushed out of the path of the spoons of a fork lift truck or from a pallet placed thereon.

In fig. 6 also the rear walls 52 and the guiding strips 53 can be seen. These rear walls play a part in correcting in the known way the perpendicular position of the pile of paper when this is lost during transport. Printing presses can only operate properly when a completely perpendicular pile of paper is delivered. When this is not the case then one places the pile in the turning over machine, moves the spoons towards each other, rotates the frame over about 90°, moves the spoons a little away from each other, so that all sheets abut neatly against the rear wall. The rear wall 52 experiences extra support now because the guiding strips

rest on the spoon carrying plates 44 and 45. Then after the frame has rotated 90°, one can let the frame rotate further or back.

The machine of the fig. 4-6 can have the disadvantage that it is too broad for the aimed purpose which is caused by the length required for the rods 40-43. The parts shown in fig. 10-12 of an other embodiment of the invented pile turning over machine, with which that disadvantage is avoided have the extra special feature that the construction height can be restricted still further, so that a more compact machine is obtained which has to the same performances a lower weight than the machine according to the embodiment of fig. 4-8. Identical parts are provided with the same reference numeral.

The support 1 of fig. 9 comprises two uprights 2 and 3 again and the frame 5 has again four spoons 6-9 which can be moved towards and away from each other parallel to themselves in a way which is to be further elucidated.

The frame 5 comprises two U-profiles 34 facing each other, which are not connected to a horizontal rod 35 close to the middle, but in backward direction by two tubes 35'. This is done to be able to position the rear walls 52 spaced from the shafts 26.

The arms 10 and 11 in fig. 9 and 10 again comprise hollow tubes in which a worm 23 can be rotated with equal speed in a nut solidly connected to the shaft 26 rotatably positioned in the uprights, by one or more motors 24. The equal speed can be achieved by a shaft coupling 60 (fig. 11).

In stead of the rolls 28 of fig. 4-6, two pairs of guiding rods 28' are used for the straight guiding of the arms in fig. 9 and 10.

The construction of the spoon carrying plates 44 and 45 of the fig. 9, 10 and 12 differs from the earlier described construction. Because the tubes 35' are positioned on a distance from the shaft 26, now jib arms 54 (fig. 10 and 12) are provided. The pairs of rolls 47 which were directly connected to the spoon carrying plates in fig. 4-6, are now connected to said jib arms 54. At the location of the connection of the rolls 47 to the jib arms 54 said jib arms have screw sockets 55 (fig. 9 and 12) in which worms 56 with left and right hand screw thread can be rotated by synchronously running motors 57 (fig. 9), so that the jib arms 54 can be moved towards and away from each other with spoon carrying plates 44 and 45 and spoons 6-9, guiding strips 58 of the spoon carrying plates 45 sliding along corresponding guiding strips 59 of the rear walls 52. This feature makes, that however the tubes 35' only support the rear walls 52, said rear walls can be constructed relatively light. For the pile of paper is clamped between the spoons 6-9 before the turning and because of that this pile will only exert a small force to the rear walls during the turning. The lower construction height of this machine with respect to the machine of the embodiment of the fig. 4-8 is an effect of the fact that one does not have to count with the thickness of the U-profiles 34 behind the pile anymore for the turning.

Other embodiments than shown in the drawing also come within the scope of the claims, in particular the insertion of an other braking device, such as a strap brake and/or a reversable ratchet-pawl-mechanism to delay the rotation of the frame when needed or to let it end in a certain position.

A braking device which makes use of the gravity is also possible and can comprise, in the way as shown in and next to fig. 9, of cam disc 61 with recesses 62 mounted on the arms 10, 11 for example welded, for load and unload positions and of a projection 63 for

letting the unstable balance position pass. Thereto a roll 64 is mounted in the uprights 10 and 11 over which said cam disc must extend and the hole 65 of the cam disc must be oblong in order to be able to let the shaft 26 pass.

The use of the invented machine is not restricted to pile turning o-er machines; other uses are to be find in the field of weld moulds for steel constructions.

CLAIMS:

1. Turning over machine, substantially comprising a support and a frame rotatable round a horizontal axis of rotation in said support, which frame is provided with guides for spoons which can be moved towards and away from each other, whereby an object such as a pile of paper can be clamped between the spoons and can be turned over by the rotation of the frame, characterized in that, the centre of gravity of the frame (5) with the object is just at the other side of the horizontal axis of rotation as the centre of gravity of the frame without object.

2. Machine according to claim 1, characterized in that the centre of gravity of the frame with or without an object can be moved with respect to the axis of rotation (26) in such a way that the frame turns over under the influence of the gravity.

3. Machine according to claim 1 or 2, characterized in that, at both sides of the machine an arm (10 and 11) is positioned between the frame (5) and the support (1), in which arm a worm (23) is positioned, both worms being synchronously drivable and which can move the frame with respect to the support by rotating in a fixed nut.

4. Machine according to one of the claims 1-3, characterized in

that, the spoons (6-9) are mounted in spoon carrying plates (44, 45) which can be moved towards and away from each other because they are guided in U-profiles (34) by rolls (47) and because they are connected by rods (40-43) to a rotatable worm (36) with left and right hand screw thread, which is solidly positioned on the frame.

5. Machine according to claim 4, characterized in that, two rolls are mounted at each end of the rod, from which the outer one can each time extend out of the U-profile (34) in the most outwardly moved position of the spoons.

6. Machine according to claim 4 or 5, characterized in that, houses (49) with narrowed throat section are mounted on the spoon carrying plates.

7. Machine according to one of the claims 1-3, characterized in that, the spoon carrying plates (44 and 45) are mounted on jib arms (54) which can be moved towards and away from each other because they are guided by rolls (47) in U-profiles (34), said jib arms bridging the distances between the rear walls (52) and the point of rotation of the frame (5) and which jib arms can be driven by rotatable worms (56) with left and right hand screw thread, solidly positioned on the frame.

8. Machine according to claim 7, characterized in that the spoon carrying plates (45) are provided with guide strips (58), at the sides turned towards the object, which strips can slide over guide strips (58) of the rear walls (52), which are turned away from the object, which are only attached to the arms (10 and 11) close to the centre by tubes (35').

9. Machine according to one of the claims 1-3, characterized in

that, the spoons are positioned on shafts (51) and are movable over a short distance parallel to themselves.

10. Machine according to one of the claims 1-9, characterized in that, the support and the frame are provided with abutments (29, 31-33) to restrict the rotation of the frame to substantially 180°.

11. Machine according to one of the claims 1-10, characterized in that, a braking device is provided to stop the rotation of the frame.

12. Machine according to claim 11, characterized in that the braking device comprises a cam disc (60) which is positioned on the arms (10 and 11), which disc is provided with recesses (62) for the load and unload positions, and a protrussion (63) to let the unstable balance position pass.

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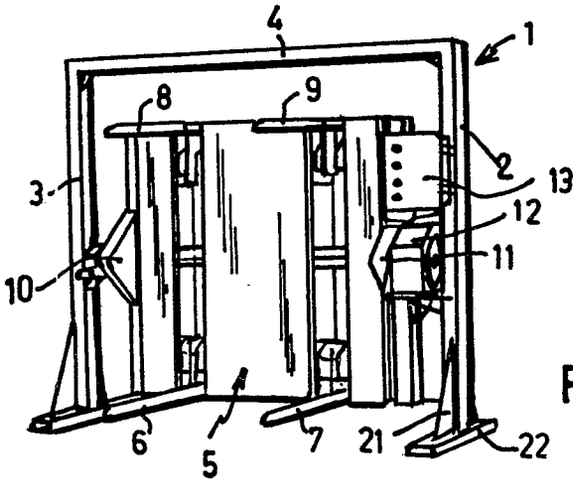

FIG.1

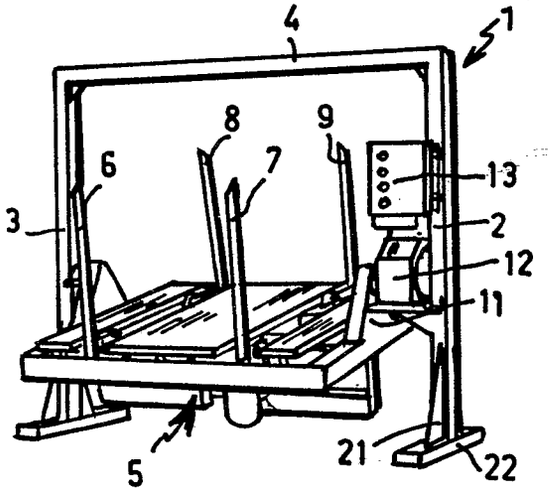

FIG. 2

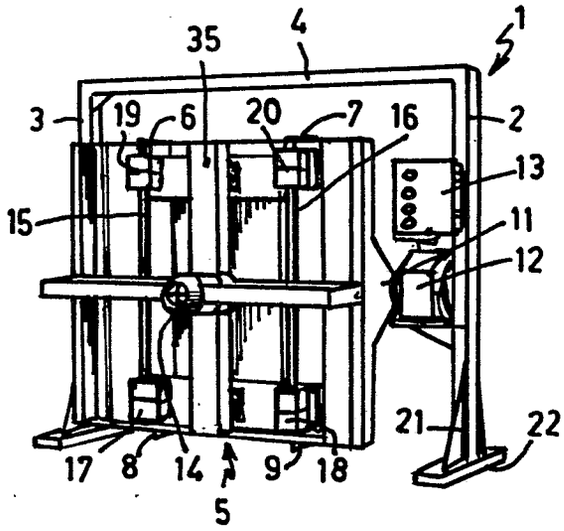

FIG. 3

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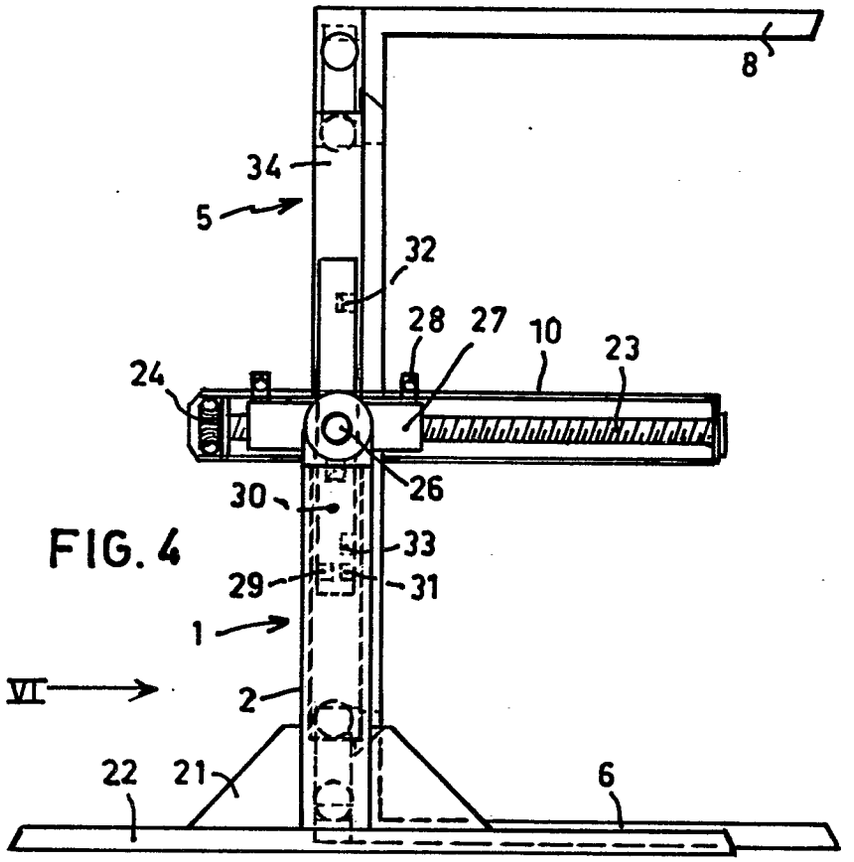

FIG. 4

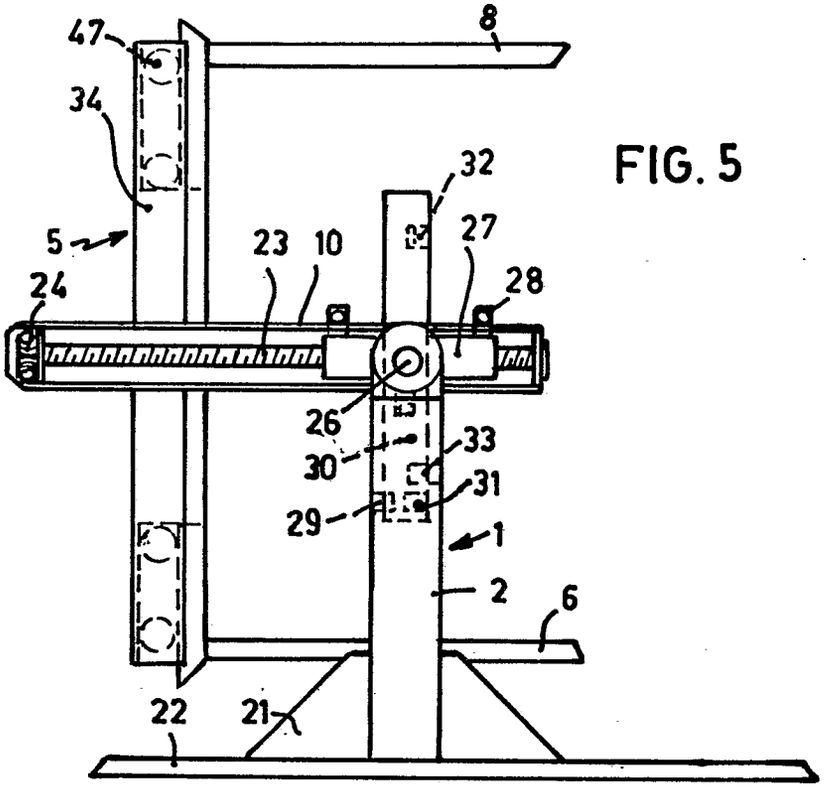

FIG. 5

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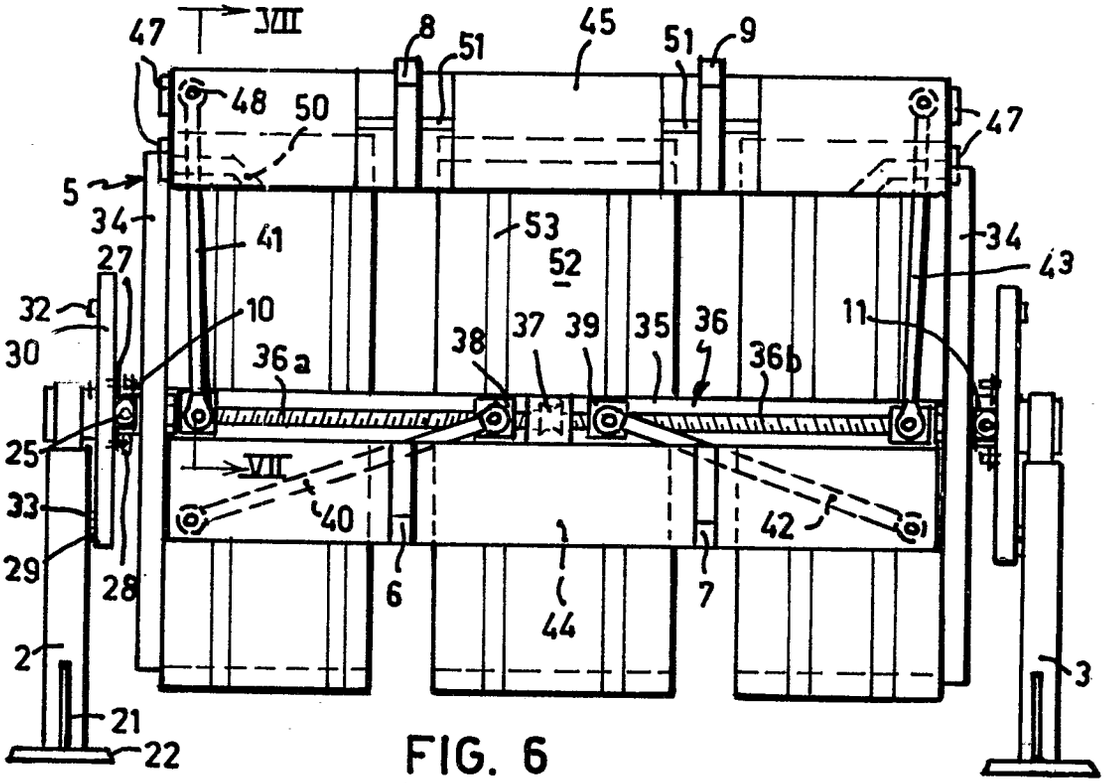

FIG. 6

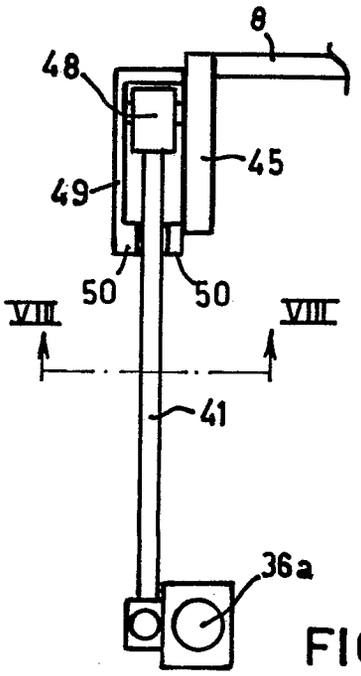

FIG. 7

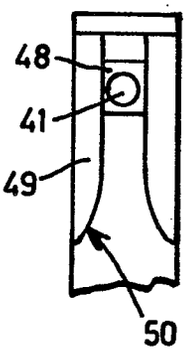

FIG. 8

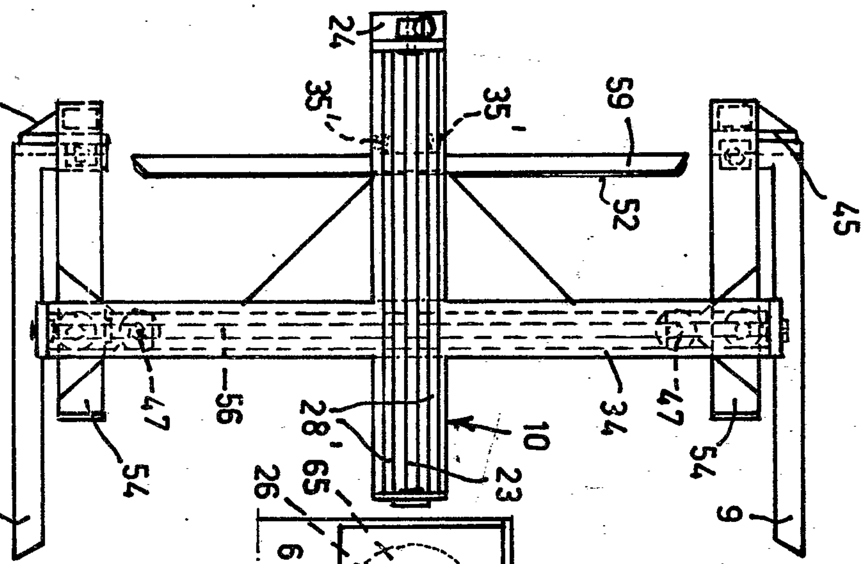

FIG.10

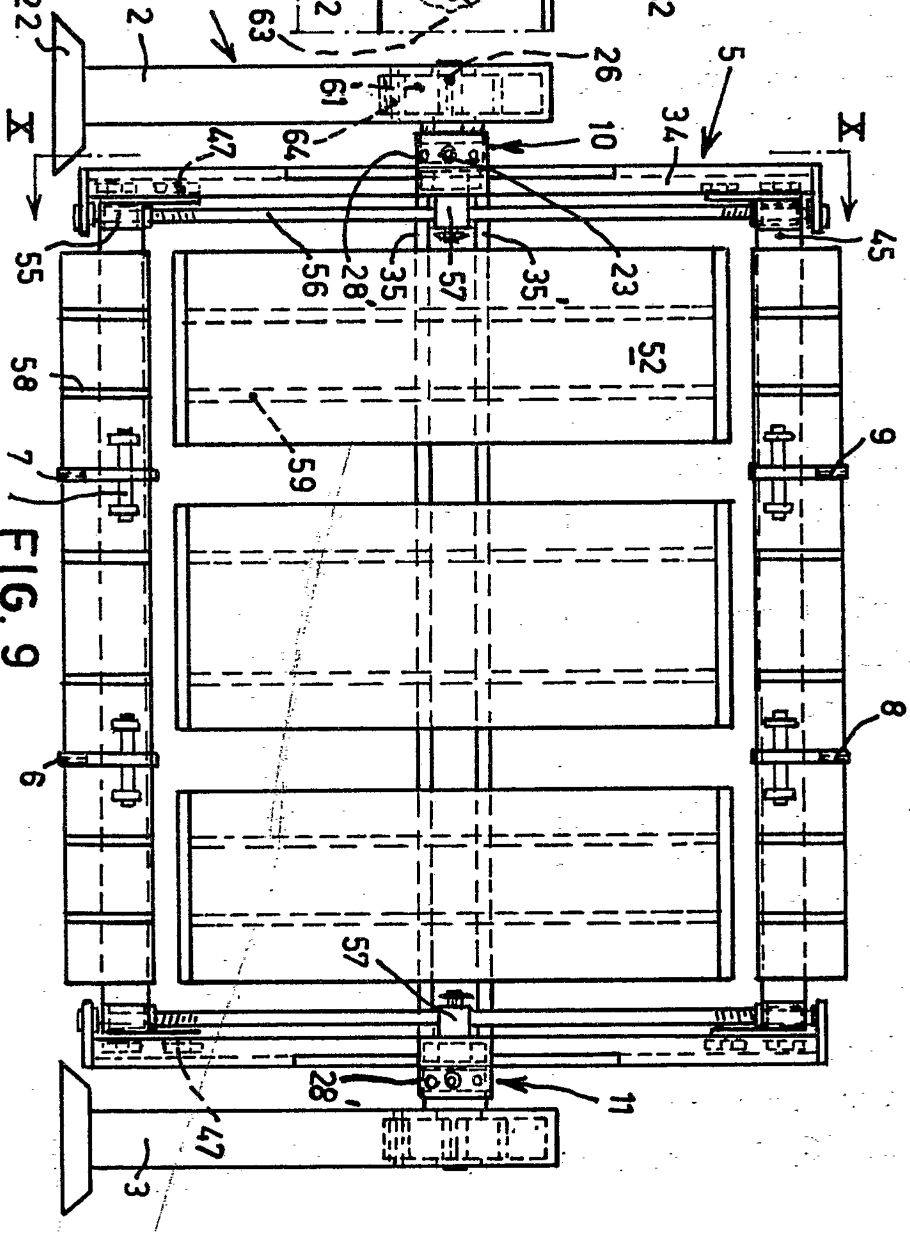

FIG. 9

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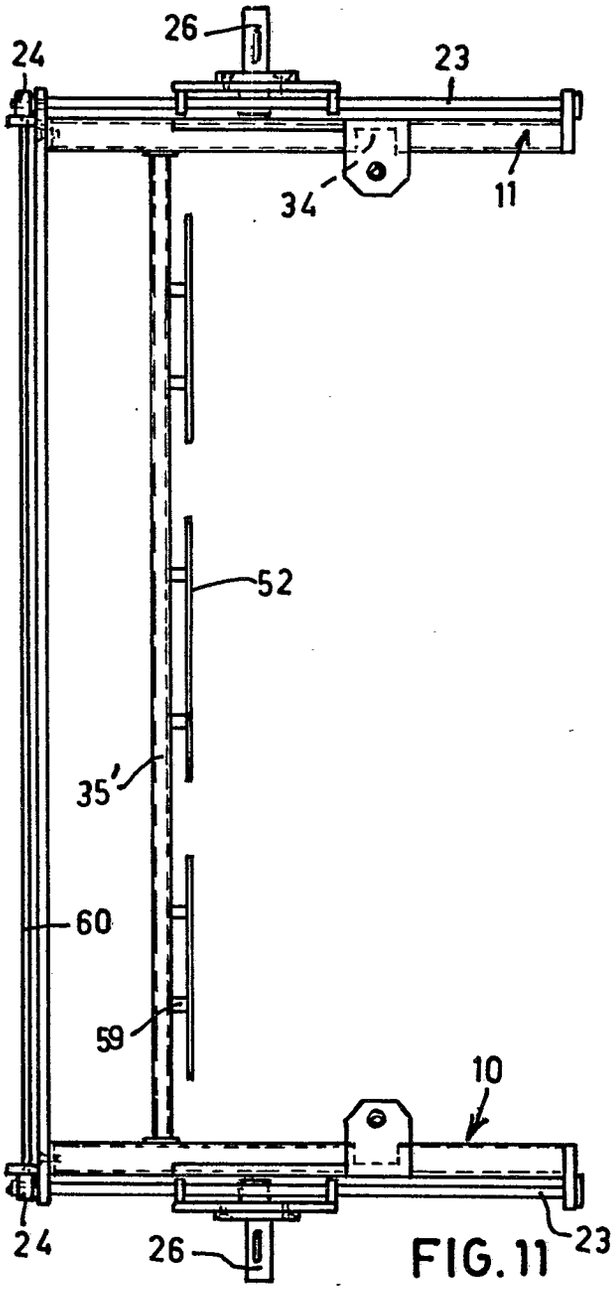

FIG. 11

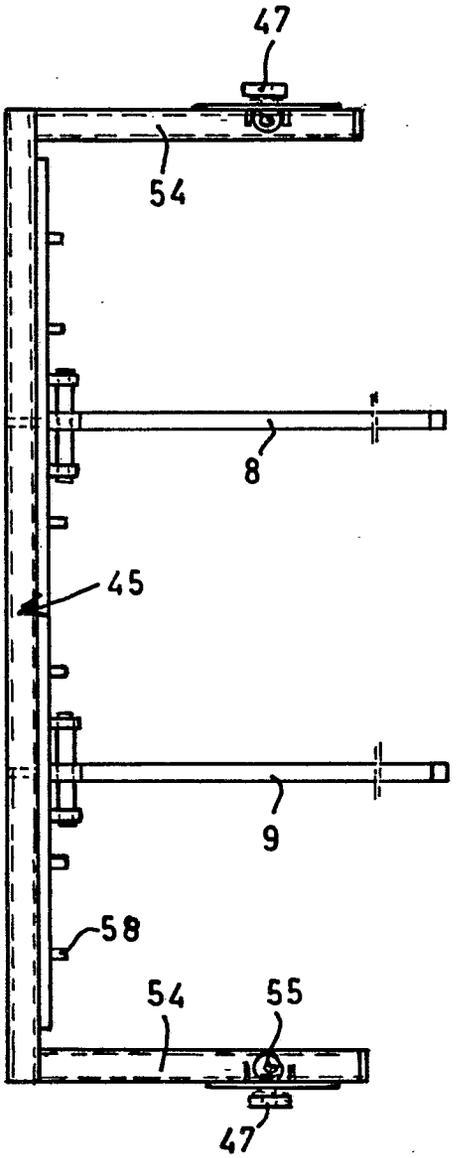

FIG. 12

European Patent Office

EUROPEAN SEARCH REPORT

Application number
0042198
EP 81 20 0662

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	US - A - 2 316 407 (COWL) * Wholly *	1,2
	US - A - 2 838 184 (MacCURDY) * Wholly *	1,4
	DE - C - 644 509 (OTTO WUSCHIG) * Wholly *	1,4
	US - A - 4 070 767 (WOODWARD) * Wholly *	1,4
	US - A - 3 547 279 (RADOMSKI) * Wholly *	1,4

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 65 H 15/00

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 65 H
B 65 G

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17-09-1981	MEULEMANS

EPO Form 1503.1 06.78