Sept. 20, 1960 R. THEILER 2,952,958

PACKING APPARATUS ON A MACHINE FOR PRODUCING BLOCKS OF KNEADABLE MATERIAL

Filed Nov. 15, 1957

2 Sheets-Sheet 1

Fig. 1

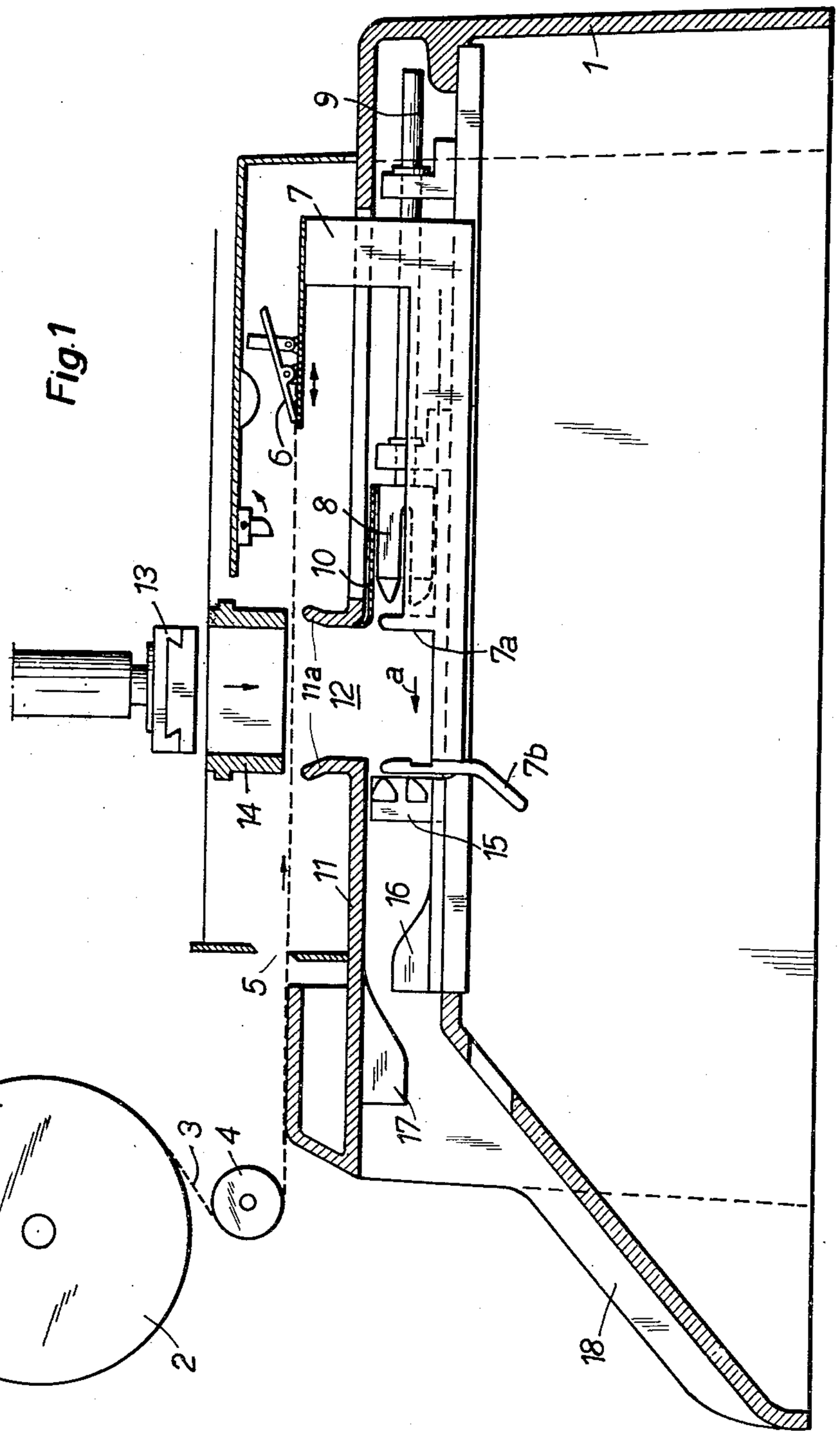

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Fig. 2

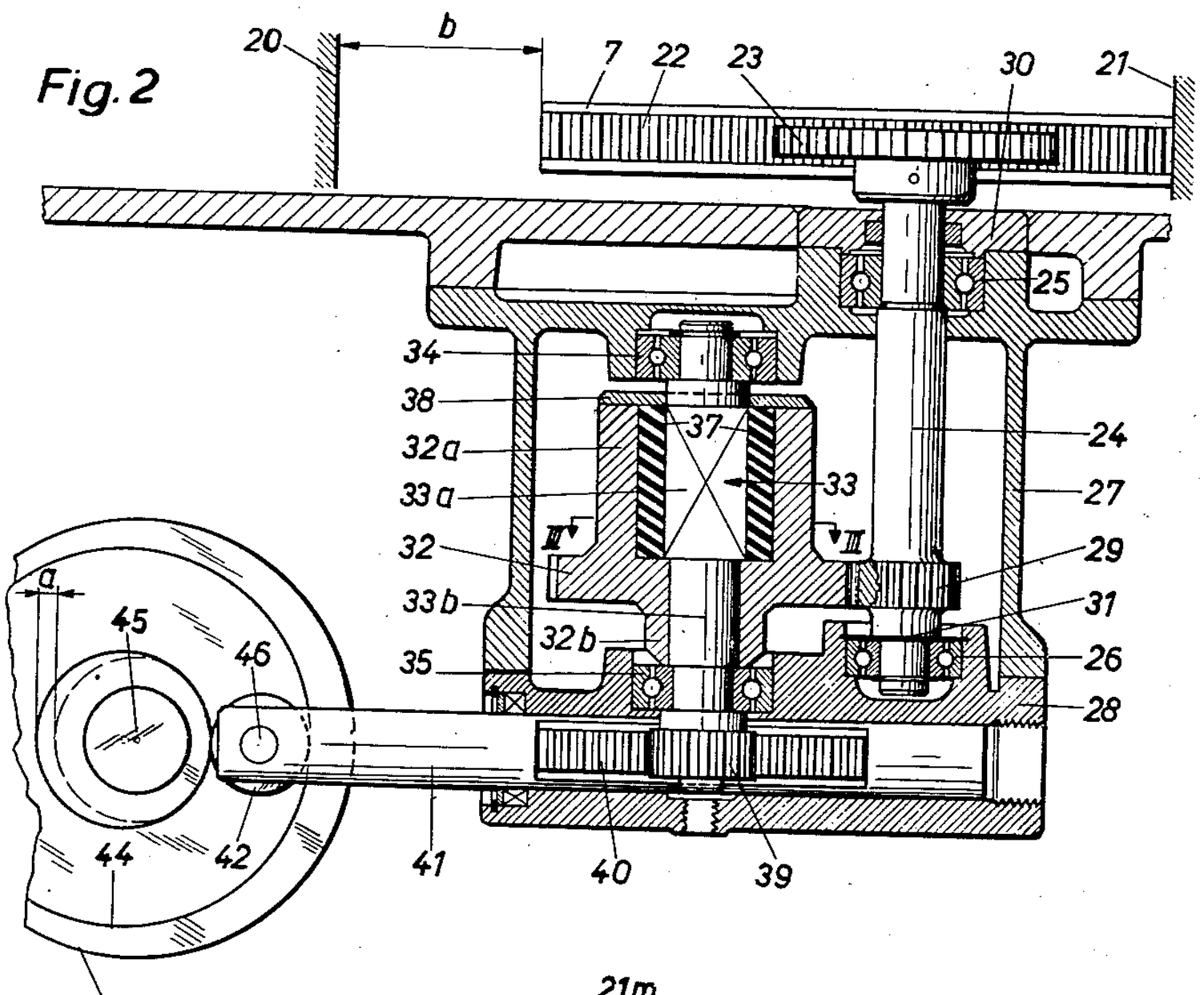
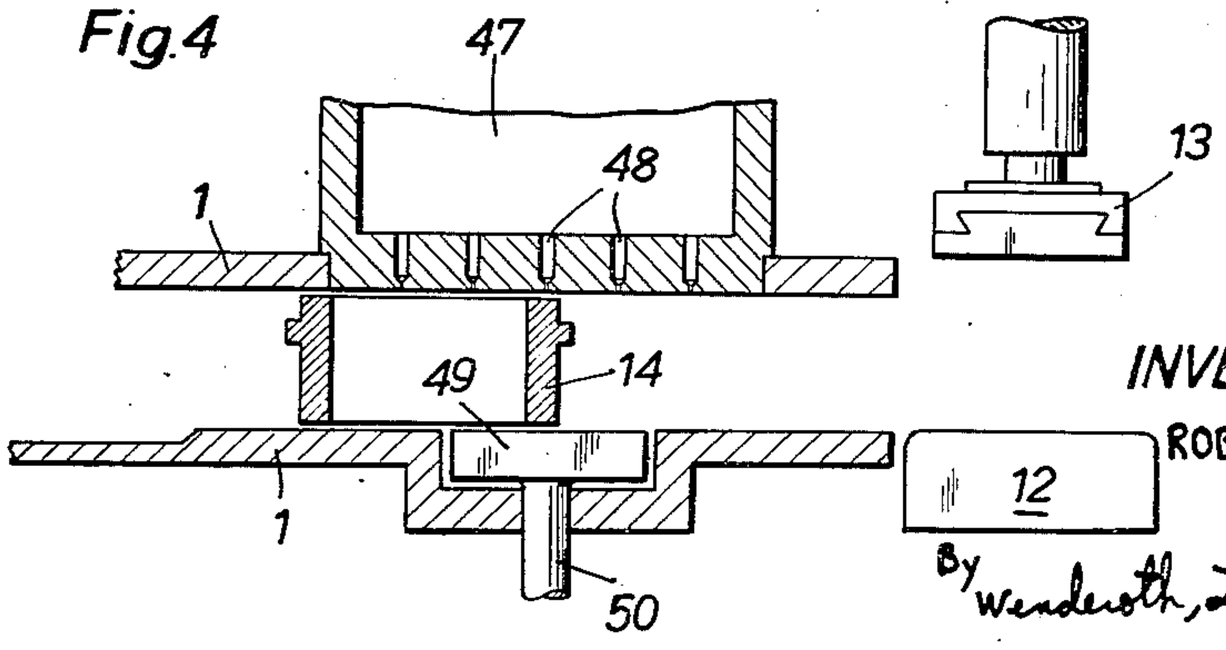


Fig. 3

Fig. 4



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PACKING APPARATUS ON A MACHINE FOR PRODUCING BLOCKS OF KNEADABLE MATERIAL

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9 Claims. (Cl. 53—230)

The present invention relates to a machine for producing blocks of kneadable or ductile material and more particularly to packing apparatus provided on such a machine.

According to the invention the packing apparatus comprises means for placing a block on a sheet of packing material and for bringing said block and sheet on a reciprocable carriage while simultaneously turning up the sheet portions on the front and rear side of the block, first folding means which are movable relatively to the carriage in travelling direction thereof, and adapted to turn down the top edge section of the rear upturned sheet portion onto the upper face of the block and to fold this sheet portion inwardly at the side, second fixedly arranged folding means for inwardly folding the front upturned sheet portion and for turning the top edge section of this sheet portion down on the top face of the block during a first portion of the operating stroke of the carriage, and folding cams for placing the lower and upper lateral flaps of the sheet on the sides of the block during a second portion of the operating stroke of the carriage.

Suitably, the means for placing the block on the sheet comprises a vertically movable ram adapted to urge the block, which is conveyed in an upwardly and downwardly open moulding cavity of a moulding slide to the packing station, downwards from the moulding slide on the prepared sheet, and to urge the block together with the sheet through a folding space onto the carriage, where the final packing of the block surrounded by the sheet in U-shaped manner then takes place. The use of folding cams for performing the last packing steps proved to be of particular advantage.

The carriage may be provided with a block support which has a rigidly secured wall, vertically projecting upwards at right angles to the direction of the stroke of the carriage, and a pivotally mounted counter-holder extending parallel to said wall. The distance between the wall and the counter-holder corresponds to the width of the folding space measured in the direction of the stroke of the carriage.

Both, the carriage together with the block support and also the moulding slide preferably are movable horizontally, the travelling directions of these two members being arranged at right angles to each other.

In expelling the block from the moulding slide through the folding space towards the carriage, the moulding slide and the block support of the carriage must be brought in perfect vertical alignment with the ram and the folding box, respectively, in the interest of perfect operation and of avoiding damages on the machine. For this purpose abutments may be provided for the carriage and the moulding slide, which abutments hold said members in an exactly aligned relative position, when the carriage or the moulding slide are urged against the abutments.

To this end a rotating main shaft and means for the conversion of the rotary motion of the main shaft into a reciprocating movement are provided, which means are in operative connection with the parts of the device moving the block by the intermediary of transmission members, the stroke imparted to the transmission members by the conversion means being greater than the stroke of these members corresponding to the mobility of the parts moving the block; in addition, one or more at least partly elastic transmission elements may be arranged in the power train between the conversion means and the parts moving the block, such that, after the parts moving the block have been positioned against their abutments, the elastic transmission element will be deformed under the continued action of the conversion means.

In a preferred construction, the reciprocating movement is imparted to the moulding slide and the carriage, respectively, by cam disks, the ratio between the eccentricity of a cam disk and the actual stroke of the slide being about 1:10. It is evident that even with most precise construction of the transmission members in the power train between the cam disk and the moved part wear, lubrication, and temperature differences produce changes in the play inevitably present in the transmission of power, in which case the inaccuracies, according to the mentioned transmission ratio of 1:10, become effective partly in tenfold enlargement, so that without the construction of the transmission elements according to the invention sometimes a sufficiently adequate bearing of the moved parts against their abutments would not be obtainable at all, while another time said parts would be forced against the abutments with an inadmissible force.

In the transporting path of the moulding slide, the apparatus may include additional parts which exert pressure upon the block. For instance embossing dies may be provided, in order to previously emboss on the block of the packing means inscriptions, markings and the like. Also with such parts the risk exists that the pliable substance tends to adhere to the pressure surface of the embossing stamp and is torn out. It is a further object of the invention to provide a wetting attachment, disposed in the travelling path of the moulding slide, for producing moistened contact surfaces between the block and those parts of the apparatus which exert pressure upon the block, in order to avoid the mentioned inconvenience.

The present invention will now be described in more detail with reference to the accompanying drawings illustrating, by way of example, a preferred embodiment of the invention, and in which:

Fig. 1 diagrammatically shows the packing apparatus in vertical section;

Fig. 2 is a sectional view of the drive for the parts moving the block,

Fig. 3 is a transverse section on the line III—III of Figure 2, and

Fig. 4 is a vertical section along the travelling path of the moulding slide.

Referring to the drawings, the machine frame **1** carries a rotatable paper supply drum **2**. The paper band or web **3** unwinding from the drum **2** passes over a guide roller **4** past a cutting device **5** to band gripping device **6** arranged at the same level as the roller **4**. The gripping device **6** is mounted on a slide or carriage **7** movable forwards and backwards in the direction of the paper web **3**. The end of the carriage forwardly situated with respect to the operating stroke of the carriage (arrow *a*) is formed as block carrier. To this end an upwardly projecting rear wall **7***a* is provided on the top side of the carriage; moreover, mounted on the free front end of the carriage **7** is a front wall **7***b*, which may be turned from its operative position indicated in the drawing, in counterclockwise direction to an inoperative horizontal position. In operative position one of its end portions projects upwardly and the other end portion projects downwardly beyond the carriage **7**. Wall **7***a* and wall

7*b* transversely extend over approximately the width of the blocks to be packed.

Mounted above the carriage **7** and secured to the machine frame **1** is a first folding fork **8**, which is carried by a spindle **9** adapted to reciprocate in an axial direction. The arms of the fork **8** are spaced apart from each other by a distance equal to the width of the blocks to be packed, so that these arms slide laterally past the wall **7***a* when the fork **8** is advanced in the direction of the arrow *a*. The folding fork **8** carries on its top side a sheet metal folding member **10**, the upturned front end of which projects beyond the ends of the arms of the fork. The vertical spacing of the folding member **10** from the top face of the bottom of the carriage end formed as block carrier corresponds to the height of the blocks to be packed.

Located between the horizontal travelling path of the paper web **3** and the carriage **7** is a folding opening **12**, which is formed by a rectangular opening in an intermediate plate member **11** and by two folding walls **11***a* limiting this opening in the direction of the travel of the carriage at the front and rear end thereof. The distance of the spaced folding walls **11***a* equals the length of the blocks to be packed, while the width of the opening **12** is somewhat greater than the width of the paper band **3**. A discharging device provided with a vertically movable ram **13** is arranged on the machine frame **1**, and disposed above the horizontal travelling path of the paper web **3** in alignment with the opening **12**.

A molding slide **14** of the machine is movable above the transporting path of the paper web **3** at right angles to the travelling direction of the web **3** and provided with a molding cavity open at the top and bottom end thereof. Said slide **14** can be brought in alignment with the discharging device **13** and the opening **12**.

At the side of the folding opening **12** situated opposite the fork **8** and below the intermediate plate member **11**, a second stationary folding fork **15** is arranged, the arms of which are secured to the machine frame and spaced from each other a distance corresponding to the width of the blocks to be packed. Adjacent to this second folding fork **15**, a first pair of folding cams **16** is secured to the machine frame **1**; the two folding cams are spaced from each other a distance equal to the width of the blocks to be packed, and their cam surfaces are upwardly inclined in the traversing direction *a*. Following this first pair of folding cams, a second pair of folding cams **17** is provided, the two cams of which are secured to the intermediate plate member **11** and spaced from each other the same distance as the folding cams **16**; the cam surfaces of the pair of cams **17** are downwardly inclined in the traversing direction *a*. The transporting path of the blocks to be packed, passing between the arms of the folding fork **15** and past the folding cams **16**, **17**, opens into a discharge chute **18**, through which the completely wrapped blocks leave the machine.

The operation of the described apparatus is as follows: Assuming the various members of the apparatus occupy the indicated readiness position, i.e. the discharging device **13**, molding cavity **14** (containing the block to be packed, but not shown in the drawing) and the block carrier **7***a*, **7***b* of the carriage **7** are in alignment with respect to each other, while the end of the paper band **3** retained by the gripping device **6** is held in stretched condition between the molding slide **14** and the folding opening **12**. The driving elements for the various movable machine parts such as folding fork **8**, carriage **7**, discharging device **13**, knife **5** and so on, are of known construction and for this reason are here not described more in detail. It is further understood that the individual operating movements of the parts are synchronized with each other so that the whole packing process takes place in a continuous and automatic manner.

At the beginning of the packing process the ram **13** pushes the block situated in the molding cavity **14** downwards onto the paper band **3**; at the same time the cutting device **5** is actuated and the gripping device **6** is opened, so that the block having left the molding cavity is forced together with the cut paper sheet into the folding opening **12**. Here the forward and the rear portions of the paper sheet are folded in upward direction so as to force the block at the slightly outwards turned wall **7***b* by means of the ram **13** further downwards into the block carrier **7***a*, **7***b* of the carriage **7** and have it enveloped by the paper sheet **3** in U-shaped manner. In order to loosen the soft mass of the block perfectly from the ram **13**, the carriage **7** is moved backwards a slight amount, i.e. towards the right hand side in the drawing, in which case at the same time the wall **7***b* is moved upright into a vertical position by striking an abutment not shown in the drawing. The ram **13** subsequently is moved upwards again into the initial position as shown, while the folding fork **8** together with the sheet metal folding member **10** are simultaneously displaced by means of the spindle **9** in the direction of the arrow *a*. Thereby, on the one hand, the upper edge section of the rear upturned sheet portion which projects beyond the block is folded by the folding member **10** onto the top face of the block, while on the other hand the laterally protruding sections of the rear sheet portion are folded by the fork **8** against the lateral faces of the block. Subsequently, the carriage **7** is moved in the traversing direction *a*, so that the block supported in the block carrier is passed between the arms of the stationary folding fork **15**. The bottom edge of the wall of the folding opening **12** situated above the folding fork **15** then folds the top edge section of the forward upturned portion of the paper sheet upon the upper face of the block, while the arms of the folding fork **8** fold the sections of this sheet portion which laterally project beyond the block inwardly against the block. When the block during the continued advance of the operating stroke of the carriage **7** leaves the folding fork, trapezoidal flaps of the paper sheet still project laterally beyond the block at the top and bottom end thereof. The lower flaps are subsequently folded upwardly against the lateral faces of the block by the folding cams **16**, whereupon as a final packing step the upper flaps are downwardly folded by the folding cams **17** and directed against the lateral faces of the block. During this last portion of the operating stroke of the carriage **7**, the downwardly protruding part of the front wall **7***b* strikes against an abutment and in doing so is tilted in the forward direction. The completely packed block thus can leave the block carrier on the carriage **7** and subsequently drops through the chute **18** out of the machine.

In the meantime, simultaneously with the carriage **7**, the engaging device **6** has also been moved in the direction of the arrow *a*, sufficiently far that it is able to grasp again the end of the paper band **3**, whereupon this device is closed and is returned together with the carriage **7** to its initial position. Thereby a new portion of the paper band **3** is drawn below the molding slide **14**, which in the meantime has delivered a new block from the machine underneath the ram **13**. The described operating process thus may begin again.

In connection with the now following description of the driving mechanism for the parts moving the block, it is to be noted that such mechanism may be used for both, the carriage and the molding slide. However, for sake of simplicity in the following explanations the description refers only to the drive of the carriage.

Referring to Fig. 2, a carriage **7**, the details of which are not shown, is movably guided between two abutments **20**, **21** on the machine frame **1**. The greatest possible operating stroke of the carriage is designated by *b*. On its longitudinal side shown in the drawing, the carriage **7** is provided with a toothed rack **22** meshing with a gear wheel **23** keyed to a shaft **24**. The shaft **24**, secured against longitudinal displacement, is

supported in two ball bearings **25** and **26**, the bearing **25** being housed in a bearing casing **27** arranged underneath the path of the carriage and the bearing **26** being accommodated in a bearing cover **28** closing the lower end of the bearing casing. The bearing **25** is held in position in the bearing casing **27** by means of a cover **30**, while the bearing **26** is retained in the bearing cover **28** by a spring washer **31**.

A gear wheel **29**, positively interconnected for rotation with the shaft **24**, meshes with a gear wheel **32** which has a greater and a smaller hollow hub **32***a* and **32***b*, respectively, and which is arranged on a portion **33***b* of a shaft **33** that is rotatably fitted into the hub **32***b*, said shaft **33** being supported in two ball bearings **34**, **35** and secured against longitudinal displacement. The bearing **34** is seated in the bearing casing **27**, while the bearing **35** is accommodated in the bearing cover **28**.

In the zone of the greater hollow hub **32***a*, the shaft **33** has a square cross-section and at this point the inner recess of the hub **32***a* is also formed as square prism, the lateral width of which is somewhat greater than a diagonal of the square cross-section of the shaft **33**. The shaft **33** thus could be rotated with respect to the hub **32***a*, that means with respect to the gear wheel **32**.

In the normal relative position (see Figure 3) of the shaft **33** and the gear wheel **32**, a diagonal *m* of the square profile **33***a* of the shaft **33** always coincides with a connecting line of the centers of two opposite sides of the prismatic recess of the hub **32***a*. Between the corners of the prismatic recess and between the sides of the square profile facing said corners, prismatic spaces of approximately triangular cross-section are thereby produced, into which cylindrical rods **37** of elastic material, e.g. rubber, are pressed under a predetermined tension. In this manner a resilient rotary connection known per se is provided between the shaft **33** and the gear wheel **32**, of which the mode of operation shall be described more fully later on. A cover **38** placed upon the gear wheel **32** at the front side thereof prevents the rubber rods from sliding out of the hub.

A gear wheel **39**, which meshes with a toothed rack **40** formed on a push rod **41**, is keyed to the end of the shaft **33** protruding into the bearing cover **28**. The push rod **41** is movably guided in the bearing cover **28** and carries at its end remote from said toothed section a roll **42** supported for rotation on a cantilever pin **46**, said roll **42** engaging in a cam groove **44** of a cam disk **43** which is driven by the main shaft **45** of the machine. The eccentricity of the cam groove **44** with respect to the main shaft **45**, i.e. the operating stroke of the cam disk, is designated by *a*.

As is evident from the drawings, the operative stroke *a* of the control disk **43** is transmitted with an increase ratio to the carriage **7** by the gear wheels **39**, **32**, **29** and **23**, the operative stroke *b* of the carriage **7** amounting to many times the length of the stroke *a* of the cam disk. According to the invention, if the transmission ratio of the transmitting members is designated by *f*, the value *b* may be expressed by the following formula: $b=f.a-e$, wherein *e* is an adequate small differential amount between the theoretical stroke and the actual operative stroke of the carriage. The magnitude and the position of the stroke difference *e* can be influenced by adjusting members, not shown, of the carriage and/or the abutments. In the following it is assumed that *e* is distributed substantially uniformly over the two end positions of the stroke of the carriage.

In the position indicated, the carriage **7** bears against the abutment **21**, while the push rod **41** has arrived at its left hand dead center position. However, in the sense of the previous statements, a difference in time and in space exists between the arrivals at these two end positions, since the carriage first has arrived at the abutment **21**. While covering the remaining distance of the operative stroke of the push rod, still remaining at this instant,

the gear wheels **23**, **29** and **32** therefore cannot be rotated any longer, so that the shaft **33** will be rotated with respect to the gear wheel **32**. This rotation, during which the rubber rods **37** in known manner roll on the surfaces surrounding them and are deformed, is indicated in Figure 3. A diagonal of the square profile of the shaft **33**, designated by *m*, would occupy the position designated by the line **21***m* in the corresponding dead center of the push rod.

Upon continued rotation of the control disk **43**, e.g. in clockwise direction, at first the shaft **33**, because of the right hand displacement of the push rod, is rotated in its indicated normal position with respect to the gear wheel **32** and subsequently takes the latter with it, whereby the carriage moves away from the abutment **21** and moves against the abutment **20** due to the corresponding rotation of the gear wheels **29** and **23** mounted on the shaft **24**. Due to the initial tension of the rubber rods **37**, the shaft **33** and the gear wheel **32** assume the relative position indicated by *m* during the entire stroke of the carriage. When however, shortly after the carriage has moved against the abutment **20**, the push rod has also arrived in its end position at the right hand side in the drawing, then the shaft **33** also has been rotated with respect to the gear wheel **32** to the position indicated by **20***m* in a manner analogous to that just described.

Due to the deformation of the resilient members built into the power train between the cam disk and the carriage, the stroke difference *e*, which basically represents also a function of the play existing in the power transmission and of the other external influences previously mentioned, is equalized and the carriage is urged exactly against the abutments in both end positions.

Referring now to Figure 4, a container **47** for a liquid is inserted in an opening of a portion of the machine frame **1** covering the path along which the molding slide **14** moves. Provided in the bottom of the container **47** are perforations **48**, which are restricted at the bottom and which open directly into the path of the molding slide **14**.

In a part of the machine frame **1** arranged below the path of the molding slide and below the container **47** an embossing die **49** is located, which is guided within a depression of the machine frame **1** and can be lifted into the path of the molding slide by means of a pressure spindle **50**. At the end of its travel, the molding slide is situated in alignment with the ram **13** and with the folding opening **12** so that the conveyed block can be pushed by the ram out of the molding slide and discharged through the folding opening.

Water is preferably filled in the container **47** and permitted to flow drop by drop through the holes **48**. In this manner the water passes to the embossing die **49** and wets the surface thereof. Also water particles are picked up and entrained by the molding slide or by the block itself, when the latter are moved past the bottom of the container **47**, so that in addition to the lower surface of the container bottom or the pressure surface of the embossing stamp, the sliding surfaces of the machine frame **1** are also wetted on both sides of the container **47** as well as the embossing die, and finally also the pressure surface of the ram **13**. Consequently, a moist contacting surface is always provided between the block and the parts of the packing apparatus engaging said block, and the wetted surfaces exerting pressure upon the block particularly prevent adhesion between these surfaces and the block.

During the embossing operation the embossing die **49** is lifted against the block, naturally only after the molding slide **14** has arrived from the position shown into alignment with the embossing die **49** and has been arrested in this position. The moistened embossing die **49** now urges the block against the moist bottom of the container **47** so as to render practically impossible any

damaging of the block caused by particles broken loose from the kneadable material.

I claim:

1. Apparatus for wrapping rectangular blocks of material, comprising a mold having an open top and bottom and being horizontally movable from a filling station to a mold discharge station, a vertically reciprocable ram over said mold discharge station and aligned with the position of said mold discharge station, a horizontally reciprocable carriage positioned below said mold discharge station in alignment with the mold dischage station and reciprocable between a block receiving position and a wrapped block discharge position, said carriage having a fixed vertical rear wall and a pivoted front wall pivotable in the direction of movement of said carriage, said carriage walls being spaced a distance equal to one horizontal dimension of the block to be wrapped, a plurality of walls between said mold discharge station and said block receiving station of said carriage defining a folding opening, the lower edge of the wall toward the direction of movement of said carriage being spaced above said carriage a distance equal to the vertical dimension of the block, a sheet feeding device for feeding a sheet of wrapping paper in a horizontal plane below the position of said mold at said mold discharge station, and above said folding opening, a first folding means reciprocably mounted behind said fixed vertical wall on said carriage for movement in the direction of movement of said carriage and having a horizontal folding plate positioned above said carriage a distance equal to the vertical dimension of the block and a folding fork having one portion on each side of said carriage, said portions spaced a distance equal to the other horizontal dimension of the block, a further folding fork having one portion mounted on each side of the path in which said carriage moves and below the lower edge of said wall of the said folding opening and spaced apart the same distance as the portions of said folding fork on said carriage, a first pair of folding cams, one mounted on each side of the path in which the carriage moves and having cam surfaces inclined upwardly from the level of said carriage, a second pair of folding cams, one mounted on each side of the path in which said carriage moves and spaced apart the same distance as said first pair of folding cams and spaced along the path in the direction of movement of said carriage from the first folding cams, and having cam surfaces downwardly inclined toward the level of said carriage, and a discharge channel at the end of the path in which the carriage moves at the wrapped block discharge position.

2. Apparatus as claimed in claim 1 in which said sheet feeding means comprises a sheet engaging device on said carriage for engaging the end of a sheet at the end of the movement of said carriage toward said discharge channel and drawing the sheet under the ram and the mold discharge station during the return movement of said carriage.

3. Apparatus as claimed in claim 2 in which said sheet feeding means further comprises sheet severing means adjacent the end of the movement of said sheet engaging device and on a level with said sheet engaging device.

4. Apparatus for wrapping rectangular blocks of material, comprising a mold having an open top and bottom and being horizontally movable from a filling station to a mold discharge station, a vertically reciprocable ram over said mold discharge station and aligned with the position of said mold discharge station, a horizontally reciprocable carriage positioned below said mold discharge station in alignment with the mold discharge station and reciprocable between a block receiving position and a wrapped block discharge position, said carriage having block receiving means thereon with a dimension equal to one horizontal dimension of the block to be wrapped, a plurality of walls between said mold discharge station and said block receiving station of said carriage defining a folding opening, the lower edge of the wall toward the direction of movement of said carriage spaced above said carriage a distance equal to the vertical dimension of the block, a sheet feeding device for feeding a sheet of wrapping paper in a horizontal plane below the position of said mold at said mold discharge station and above said folding opening, a first folding means reciprocably mounted on said carriage for movement in the direction of movement of said carriage having means for folding wrapping paper onto the top of the block and against the sides of the block, further folding means along the path in which said carriage moves and below the lower edge of said wall of the said folding opening for folding wrapping paper against the sides of the block, a first pair of folding cams, one mounted on each side of the path in which the carriage moves for folding wrapping paper up against the sides of the block, a second pair of folding cams, one mounted on each side of the path in which said carriage moves and spaced apart the same distance as said first pair of folding cams and spaced along the path in the direction of movement of said carriage from the first folding cams, and a discharge channel at the end of the path in which the carriage moves.

5. Apparatus as claimed in claim 4, wherein the first folding means comprises a folding fork having two arms spaced apart from each other transversely to the travelling direction of the carriage a distance substantially equal to the width of the block to be packed.

6. Apparatus as claimed in claim 4, wherein each pair of folding cams comprises two cam surfaces arranged laterally of the path of said carriage, the first pair of folding cams mounted along the path adjacent said further folding means for folding the lower lateral flaps of the wrapping sheet upwardly, the second pair of folding cams being mounted along the path adjacent the discharge channel for turning the upper lateral flaps of the wrapping sheet downwardly.

7. Apparatus as claimed in claim 4, and a wetting device mounted along the path of said mold between the mold filling and mold discharge station for producing wetted contacting surfaces between the block and the parts of the apparatus exerting pressure upon the block.

8. Apparatus as claimed in claim 7, wherein the wetting device is a container having holes in the bottom opening into the path of the molding.

9. Apparatus as claimed in claim 8 and an embossing die along the path of said mold opposed to said container, the bottom of the container serving as a counterpressure surface for the embossing die.

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