

Aug. 8, 1961

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2,994,936

CONDUIT BLOCK MAKING MACHINE

Filed Oct. 5, 1959

6 Sheets-Sheet 1

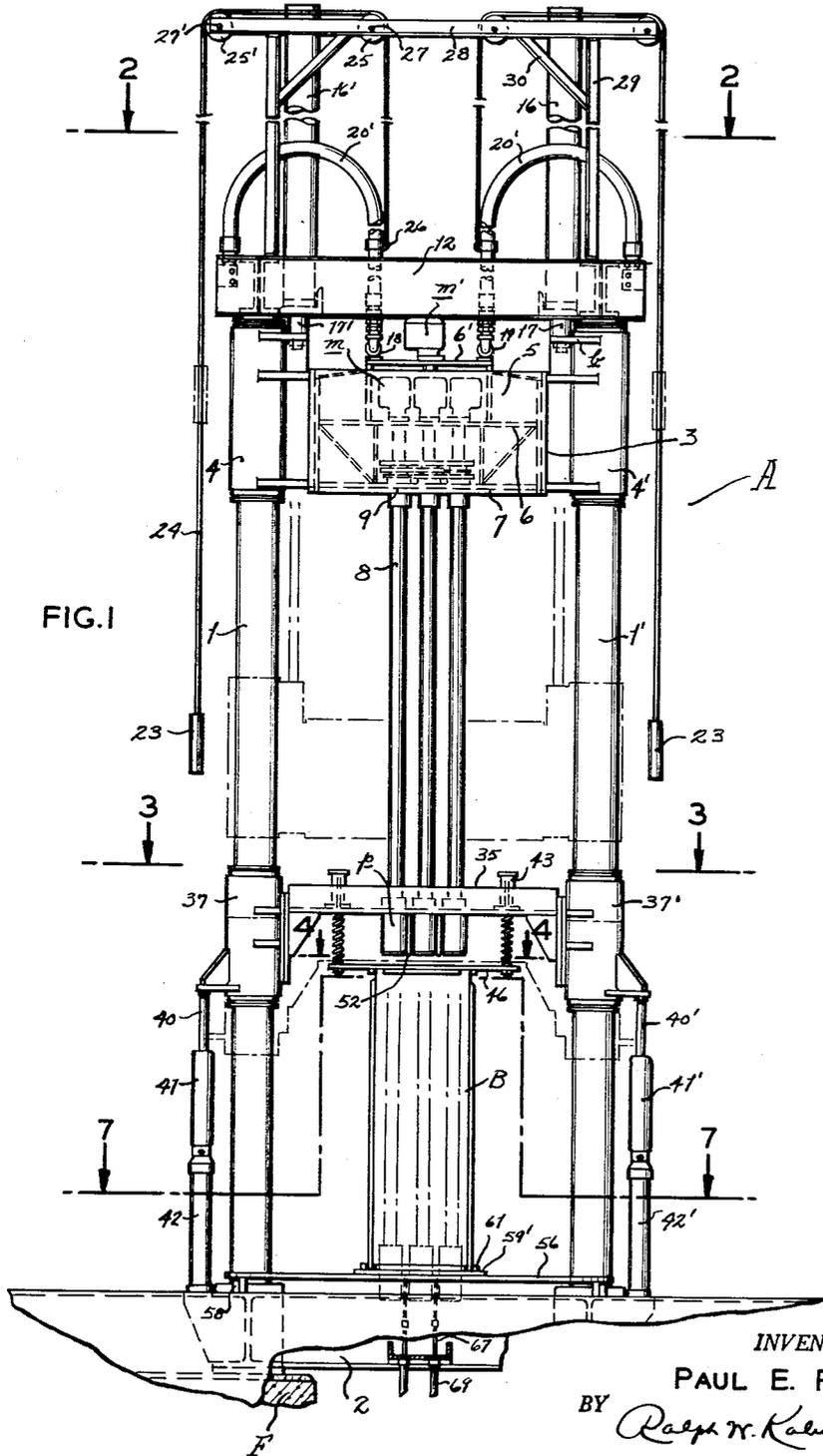


FIG. 1

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6 Sheets-Sheet 2

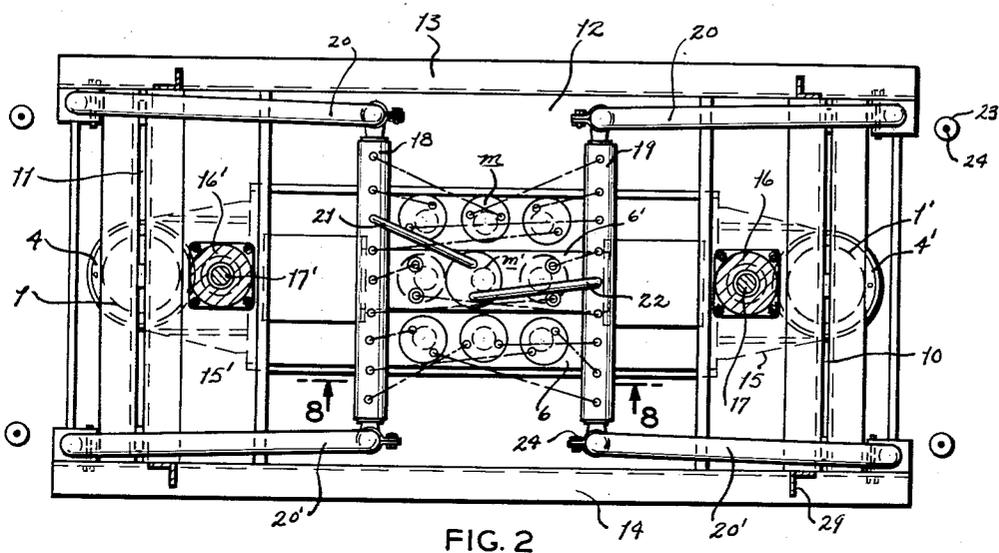


FIG. 2

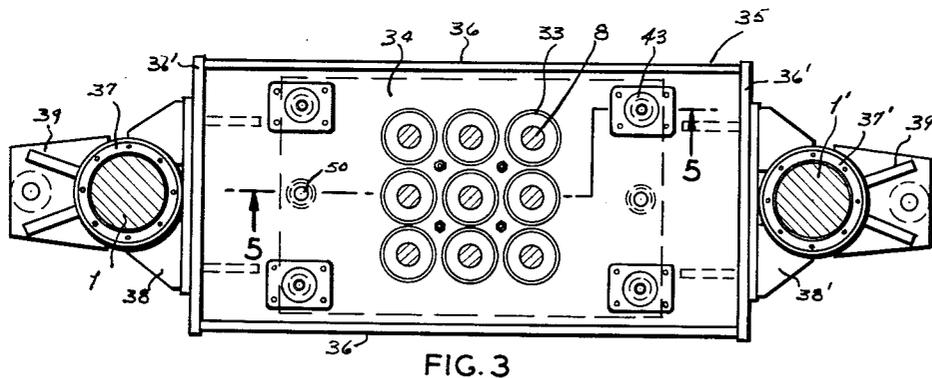


FIG. 3

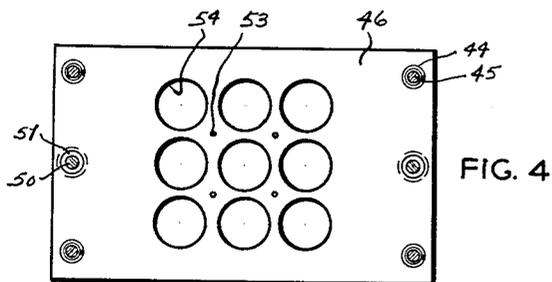


FIG. 4

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6 Sheets-Sheet 4

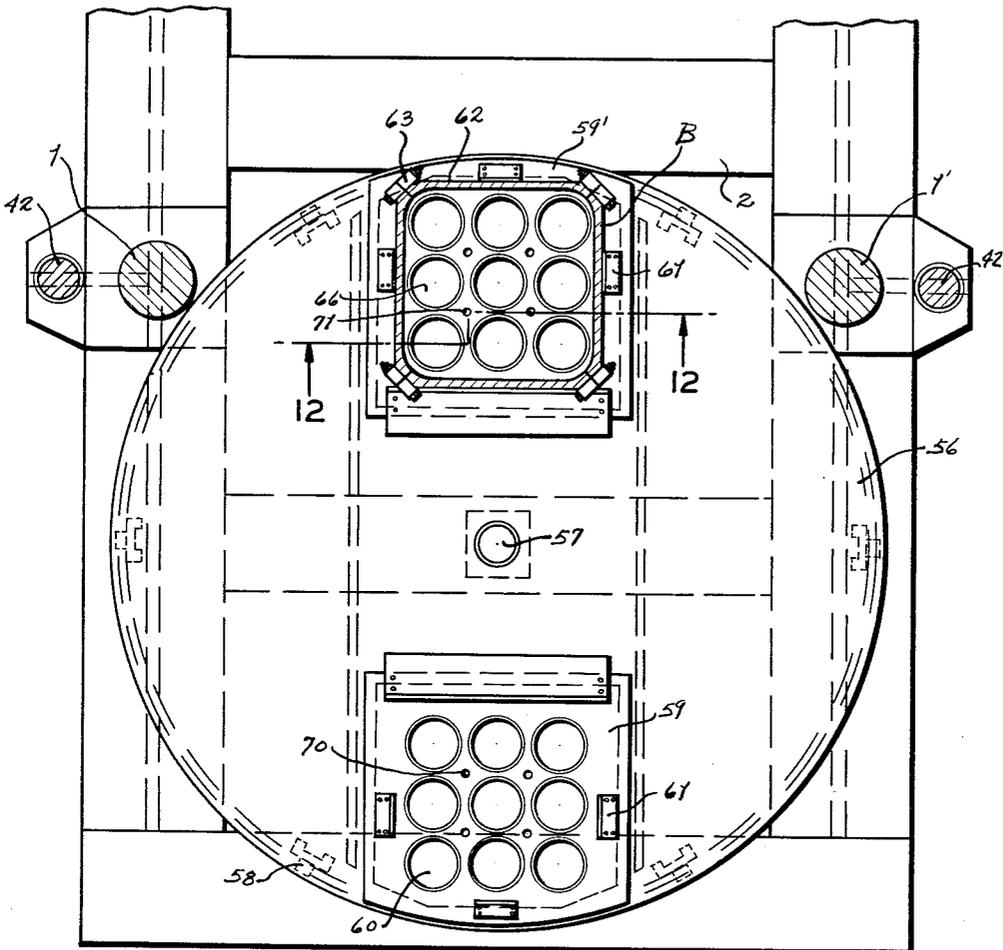


FIG. 7

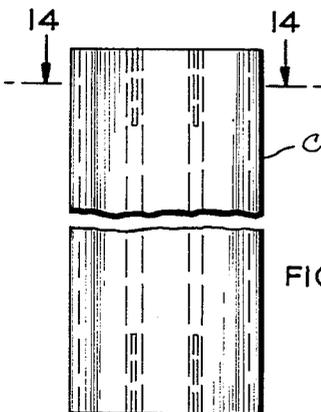


FIG. 13

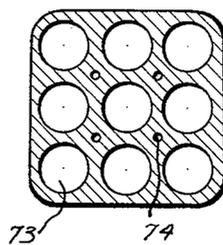


FIG. 14

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6 Sheets-Sheet 5

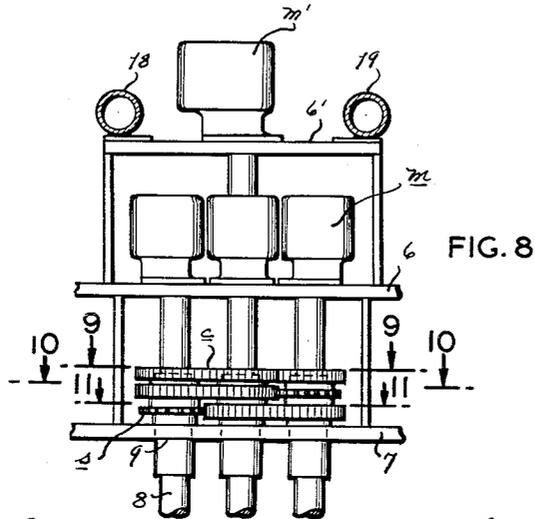


FIG. 8

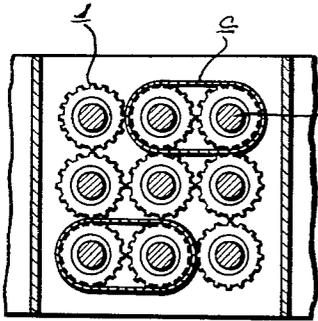


FIG. 9

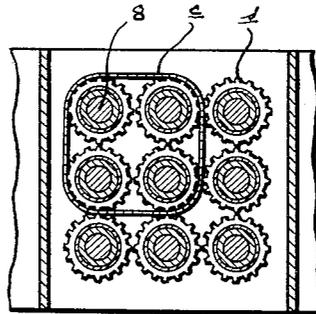


FIG. 10

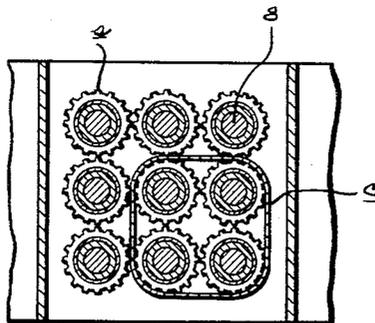


FIG. 11

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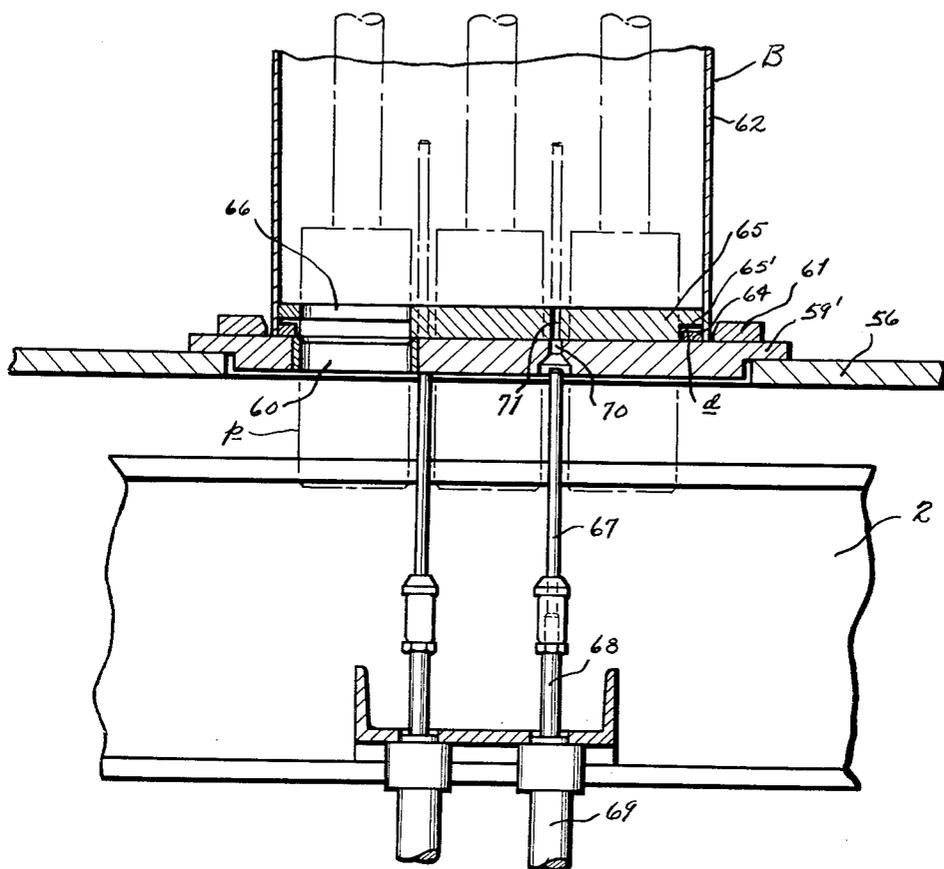


FIG. 12

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CONDUIT BLOCK MAKING MACHINE

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9 Claims. (Cl. 25—34)

This invention relates in general to conduit blocks and, more particularly, to certain new and useful improvements in machines for making same.

It is an object of the present invention to provide a conduit block making machine which is adapted for producing blocks having varying numbers of conduits or ducts formed therein.

It is a further object of the present invention to provide a conduit block making machine wherein individual drive means are provided for each duct-forming member so that selected of such drive means may be operated at any one time to form blocks having preselected duct-patterns.

It is another object of the present invention to provide a conduit block making machine which is adapted for highly reliable, economical, and durable performance, having a relative simplicity of parts, so that the same is not subject to frequent "down time."

It is a further object of the present invention to provide a conduit block making machine which incorporates novel means for positioning, and maintaining in position during operation, mold boxes.

It is a still further object of the present invention to provide a conduit block making machine which is relatively simple in operation, requiring minimum supervision and wherein the same will produce conduit blocks of consistently excellent quality.

Other objects and details of the invention will be apparent from the following description, when read in connection with the accompanying drawings (six sheets) wherein:

FIGURE 1 is a front elevational view of a conduit block making machine constructed in accordance with and embodying the present invention.

FIGURE 2 is a horizontal transverse section taken on the line 2—2 of FIGURE 1.

FIGURE 3 is a horizontal transverse section taken on the line 3—3 of FIGURE 1.

FIGURE 4 is a horizontal transverse section taken on the line 4—4 of FIGURE 1.

FIGURE 5 is a vertical transverse section taken on the line 5—5 of FIGURE 3.

FIGURE 6 is a vertical transverse section taken substantially along the line 5—5 of FIGURE 3, but illustrating the hopper box and stripper plate in immediate adjacency.

FIGURE 7 is a horizontal transverse section taken on the line 7—7 of FIGURE 1.

FIGURE 8 is a vertical transverse section taken on the line 8—8 of FIGURE 2.

FIGURE 9 is a horizontal transverse section taken on the line 9—9 of FIGURE 8.

FIGURE 10 is a horizontal transverse section taken on the line 10—10 of FIGURE 8.

FIGURE 11 is a horizontal transverse section taken on the line 11—11 of FIGURE 8.

FIGURE 12 is a vertical transverse section taken on the line 12—12 of FIGURE 7.

FIGURE 13 is an elevational view of a conduit block formed by operation of the present invention.

FIGURE 14 is a horizontal transverse section taken on the line 14—14 of FIGURE 13.

Referring now by reference characters to the drawings which illustrate the preferred embodiment of the present invention, A broadly designates a conduit block making machine comprising a pair of horizontally spaced apart, vertically extending columns or posts 1, 1', which at their

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lower ends are secured upon a base frame structure, indicated at 2, and located below floor level, being mounted upon a foundation F. Provided for vertical reciprocal travel along columns 1, 1' is a motor head or carriage 3 comprising a pair of sleeves or bearing housings 4, 4' for movement along columns 1, 1', respectively, and a central or intermediate frame body portion 5 which includes upper and lower transverse, parallel plates 6, 7, respectively. Mounted on upper plate 6 is a plurality of hydraulic motors *m* which may be of any selected number but, for purposes of example herein, are shown as totaling nine, and being arranged in rows of three, with the central motor *m'* being supported upwardly of the others upon a suitable mounting plate 6'. The drive shaft of each motor *m*, which projects downwardly, is engaged to an elongated, vertical shaft or spindle 8; said latter being axially parallel to columns 1, 1', and each being journaled in a bearing 9 mounted in lower transverse plate 7 of frame body portion 5 of head 3. Each shaft 8 carries at its lower end a packing head *p*. In order that the said shafts 8 will rotate uniformly at like angular rate, the same are interconnected by a system of sprockets *s* mounted fixedly upon the shafts 8 upwardly of bearing 9 with a series of endless chains *c* engaging the sprockets *s* within any one plane, all as may be more fully seen in FIGURES 8, 9, 10, and 11; it being recognized that any interlinking, effective pattern or arrangement of sprockets *s* and chains *c* may be adopted, as the system illustrated is merely exemplary. Implicitly, the utilization of a geared interengagement between the shafts 8 would be within the scope of the present invention. Mounted upon the upper ends of columns, 1, 1' are the side elements 10, 11 of an open, rectangular support frame 12 having front and back cross members 13, 14, respectively, which extend at their ends laterally outwardly of side elements 10, 11; said frame 12 being formed preferably of channel stock. Supported upon brackets 15, 15' fixed to each column 1, 1' and the adjacent side elements 10, 11, are vertically presented hydraulic cylinders 16, 16', respectively, each having at its lower end a piston 17, 17', respectively, which are engaged to a fitting or boss *b* provided upon the related sleeve 4, 4' of head 3 whereby upward and downward sliding movement of said head 3 may be effected, responsive to the direction of the stroke of piston 17, 17'.

Positioned on opposite sides of the aforesaid central motor *m'* and supported on plate 6' are hydraulic fluid intake and outlet manifolds 18, 19, respectively (see FIGURE 2), each of which is connected at its opposite ends to flexible hose connections 20, 20', for communication with a pump and source of fluid (not shown) of a conventional hydraulic system. Each manifold 18, 19 is connected by individual conduits, such as 21, 22, respectively, to the related side of each hydraulic motor *m* for respective supply and withdrawal of hydraulic fluid therefrom. It is to be observed that individual, selected motors of the total group may be operated through a fluid control system (not shown) which conforms to well known practice, so that an operator may only operate certain of the motors for specialized molding operations.

Hose sections 20, 20' are of such length as to accommodate the vertical travel of motor head 3. To assist in the upward movement of each of said section 20, 20', upon return travel of head 3, there is provided a counterweight 23 for each of said hose sections 20, 20'; said counter weight 23 being located outwardly of the adjacent column 1, 1' and being carried at the end of a cable 24, which extends upwardly and is trained over a pair of inner and outer horizontally aligned pulleys 25, 25', and thence led downwardly for securement, as by clamp 26, to the related hose section 20, 20' proximate to the point of engagement of the latter to the related manifold 18, 19,

as the case may be. Said pulleys 25, 25' (there being four such pair) are mounted on rods 27, 27', respectively, which are fixed at their ends in parallel frame members 28 presented at the upper ends of uprights 29, the lower ends of which are welded or otherwise secured upon frame 12; there being braces 30 for rigidifying the pulley support structure.

With reference to FIGURE 1, it will thus be seen that as motor head 3 travels downwardly along columns 1, 1', hose section 20, 20' will likewise be caused to extend downwardly at their inner ends, causing a simultaneous raising of their respective counterweights 23, as shown in phantom lines. However, upon upward or return travel of said motor head 3, counterweights 23 will descend, through gravity, and effect an upward pulling upon the related hose sections 20, 20' to assure their restoration to initial, fully serviceable position.

Although the drawings show that conduit block machine A is provided with 9 hydraulic motors *m*, said machine may comprise any number of such motors as desired. Normally, conduit blocks of the type being made by machine A will contain nine ducts, although blocks having a lesser number, some of which are also widely utilized, may be as easily produced. Consequently, in order to produce a block with less than nine ducts, it is only requisite to de-energize such of the motors *m* as necessary. It is quite apparent that machine A could be built with any number of motors rather than merely the nine shown, and, accordingly, the present invention is not limited to a machine having only nine such motors.

Each of the packing heads *p* is of general cylindrical, conventional form, having a diameter greater than the associated shaft 8 and incorporating an axial recess 31 at its lower end and a pair of so-called "ears" 31' at its upper end for cooperation with the "ears" of the adjacent packing heads *p* to effect a packing and troweling action during conduit formation; which cooperative operation requires the uniform rotation of shafts 8 as brought about by sprockets *s* and chains *c*, and with a central transverse portion 32 axially drilled for engagement, as by bolt 32', to the lower end of the related shaft 8. The lower ends of shafts 8 together with the packing heads *p* thereon extend through related openings 33 formed in the base wall 34 of a hopper box 35, having upstanding side and end walls 36, 36', respectively, and being presented transversely between columns 1, 1'; there being sleeves or bearing housings 37, 37', for respective disposition about said columns 1, 1' engaged to the opposite sides of said hopper box 35 through connecting support portions 38, 38'. Each sleeve 37, 37' is engaged on its outer side, as through a bracket 39, 39', with the upper end of a piston 40, 40', respectively, of a vertically presented hydraulic cylinder 41, 41', respectively, the lower ends of which latter are mounted upon supports 42, 42', respectively, anchored at their lower ends upon base structure 2. Thus, pistons 40, 40' are axially parallel to columns 1, 1' and adapted upon their upward stroke to effect a lifting of hopper box 35 while, conversely, upon downward, movement, to cause descent of the same, for purposes presently appearing.

Mounted upstandingly upon the upper surface of base wall 34 of box 35 are four vertical, spaced apart housings 43, for compression springs 44, which are encirclingly disposed about elongated rods 45; the upper ends of said springs 44 bearing against the upper end wall of the related housing 43 while the lower ends bear against the upper surface of a stripper plate 46 located below hopper box 35 in planar parallel relationship to base wall 34 thereof. Said rods 45 are fixed at their upper ends within housing 43 while the lower ends project freely through openings 47 formed in stripper plate 46 with a retaining nut 48 being mounted upon the projecting end of each to serve as a detent for preventing disengagement from stripper plate 46. Thus, said springs 44 bias stripper

plate 46 into downwardly spaced relationship with respect to hopper box 35. Provided on opposite side portions of base plate 34 of hopper box 35 is a pair of guide pins 50 depending downwardly therefrom for slideable reception within sleeve-like members 51 formed on stripper plate 46, whereby said guide pins 50 will maintain hopper box 35 and stripper plate 46 in proper aligned relationship. Also secured in base wall 34 of hopper box 35, and extending from the under surface thereof, are four upper mold pins 52 located within the area bounded by the apertures 33 so that the same will extend, during molding operation, downwardly, through aligned openings 53 in stripper plate 46 and into interstitial portions of the conduit block being formed. Stripper plate 46 is a flat, rectangular, relatively thin member being carried upon the nuts 48 mounted on slide rods 45 and, as described above, urged downwardly from hopper box 35 by means of springs 44. Said stripper plate 46 is provided with a series of central apertures or openings 54 which are respectively aligned with the openings 33 of base wall 34 of hopper box 35, for passage therethrough of packing heads *p* and their associated shafts 8. Suitably mounted upon the under surface of stripper plate 46 is a series of mold guide members 55 for properly locating and maintaining a mold box B in operating position, as will be described more fully hereinbelow.

Referring now to FIGURE 7, there is shown a circular turntable 56 adapted for rotation about a vertical shaft 57 journaled within base structure 2, there being a plurality of rollers 58 provided on the periphery of said turntable 56 for assisting same during revolution as well as preventing any planarwise twisting or misalignment thereof. Carried on said turntable 56 is a pair of diametrically opposed pilot or guide plates 59, 59', each of which is provided with a plurality of apertures 60 in alignment with apertures 54 of stripper plate 46 and 33 of hopper box 35 for extension therethrough of packing heads *p*. Each pilot plate 59, 59' embodies a plurality of upstanding mold guides 61 for supporting and locating the lower end of mold box B, as the same is disposed upon a pilot plate. It will be noted that with turntable 56 in the position shown in FIGURE 7, pilot plate 59' will be presented substantially intermediate the lower ends of columns 1, 1' wherein the apertures 60 thereof will be in alignment with the apertures 54, 33 of stripper plate 46 and hopper box 35, respectively, and thus, the said pilot plate 59' is in, what might be termed, "operative position" while the other pilot plate 59 is presented in, what might be termed, "preparatory position" in that it is accessible for mounting thereon of an empty mold box B readied for being rotated into operative position upon completion of the molding operation within the mold box disposed upon pilot plate 59'. Although not depicted in the drawings, there is provided with turntable 56 a system of micro-switches for assuring proper positioning of plates 59, 59', as machine 9 will be rendered inoperative by said switches unless the said plates are accurately positioned.

Mold boxes B as used with the present invention are of general four-sided construction, being preferably of cast aluminum, and elongated commensurately for the desired length of conduit block to be formed therefrom. Said mold boxes B are constituted of wall-forming sections 62, which are engageable at their meeting edges by readily manipulated latch members 63 so as to provide an enclosed four-sided receptacle for the mold material. At the lower end of the wall-forming sections 62 of mold box B is a continuous, inwardly projecting base shoulder 64 adapted for supporting, in a manner to be shortly described, a base pallet 65 which latter is undercut along its periphery to define an overhang 65' aligned with the said shoulder 64, but with the height of such overhang 65' being slightly greater than the height of shoulder 64 so that when said pallet 65 is in position upon the particular pilot plate, there will be normally an intervening spac-

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ing therebetween as at *d* in FIGURE 7. Pallet 65 is provided with a series of openings 66 for alignment with the openings 60 in pilot plates 59, 59' for projection there-through of packing heads *p*.

Presented for extension upwardly, into the interstitial, or wall, portions between the ducts of the conduit block to be formed are four, horizontally spaced apart lower mold pins 67, each carried on the upper end of a piston 68 of a hydraulic cylinder 69 mounted within base structure 2, upon foundation F; said cylinders 69 being integrated within the same system as cylinders 41, 41', as well as cylinders 16, 16' hereinabove described so that the upper and lower mold pins 52, 67 will be inserted within the mold box interior prior to the molding operation, and will be simultaneously withdrawn after completion of the molding operation; and whereby the former action will occur as head 3 travels downwardly into starting position, and the latter will occur after head 3 shall have been returned to full up position, and closed a normally open limit switch (not shown) located for actuation by an arm or other switch-engageable member (not shown) carried on head 3. The said lower mold pins 67 project through aligned openings 70, 71 in pilot plates 59, 59' and pallet 65, respectively.

In the operation of machine A, with the same in initial or starting position, as shown in full lines in FIGURE 1, and mold box B disposed upon pilot plate 59' between columns 1, 1' beneath stripper plate 46 which will be disposed upon the upper end thereof, with mold guides 55 assuring proper location of the box B. The operator, by means of a manual lever, actuates the hydraulic system comprising cylinders 16, 16', 41, 41', 69 causing head 3 to descend and effect movement of hopper box 35 for lowering of same to present it into immediate overlying abutting relationship upon stripper plate 46 (see FIGURE 6), thus compressing springs 44 and causing guide pins 50 to extend downwardly as well as for the lower mold pins 67 to be brought upwardly through the aligned openings 70, 71 and into the lower interior portion of said mold box B. It will be seen that the firm disposition of hopper box 35 upon stripper plate 46 will stabilize the latter to avoid any undesired turning, or shifting movement of mold box B during the molding operation, as might be produced under torque developed by shafts 8. Thus, stripper plate 46 is securely clamped on mold box B which latter is reliably maintained in rigid position during the molding operation. With motor head 3 in full down position packing heads *p* will project through the openings in the pallet 65 and pilot plate 59' (FIGURE 12). With the packing heads *p* so lowered, the operator may then easily cause molding materials, such as mixed concrete, cement, or the like, to be delivered to mold box B through the openings 33 of said hopper box 35 and the aligned openings 54 of stripper plate 46; it being noted that there will be adequate space for the descent of such material, as such openings are of greater diameter than that of the shafts 8 located therein. The molding material may be delivered to the hopper box 35 in any suitable manner, such as by conveyor, and the like, and the same may be easily fed to the mold box B, by hand, through the said openings, as above described. After the molding material has been presented to the mold box B so as to fill the voids or open spaces therein, between and about the shafts 8 and packing heads *p*, hydraulic motors *m* are energized so as to effect rotation of shafts 8 and substantially simultaneously therewith hydraulic cylinders 16, 16' are caused, as by appropriate manipulation of a conveniently located hand lever, to effect a retracting or lifting movement of their related pistons 17, 17' so as to cause ascent of motor head 3. Thus, shafts 8 with their related packing heads *p* will be rotating and traveling axially upwardly through the molding material within mold box B with each packing head *p* effecting formation of a duct having a diameter substantially the same as the outside diameter of said packing

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heads *p*. When the packing heads *p* have been withdrawn from the mold box B, that is, when motor head 3 is in full upward position as shown in full lines in FIGURE 1, the same will close the normally open limit switch, whereby hydraulic cylinders 41, 41' and 69 are actuated for effecting withdrawal of upper and lower mold pins 54, 67. In the withdrawing action of upper mold pins 54 hopper box 35 will be carried upwardly into the position shown in full lines in FIGURE 1, thereby causing release of tension upon springs 44 so that stripper plate 46 will be presented spacedly downwardly below hopper box 35. By such withdrawing action of hopper box 35 the downward pressure upon mold box B is removed and thereupon turntable 56 may be rotated so as to present an empty mold box into position preparatory to the next molding operation and to present the mold box 3 containing the fully molded conduit block in position for removal from machine A. The latter may be transported from turntable 56 by any suitable means, such as, preferably, by a small hand cart, and by such removal it will be noted that pallet 65 is freed to descend, through gravity, into seated, abutting relationship upon shoulder 64 of mold box B and in so moving the same will effect a stripping of the molded block from the side walls of mold box B, thus breaking the vacuum which will have developed therein. After removal from turntable 56, the mold box B is split as by disengagement of latch elements 63 to allow freeing of the conduit block which has been formed and which is indicated at C, in FIGURES 6 and 7. It will thus be seen that the said block contains nine ducts, 73, which correspond in diameter and in position to the various packing heads *p*, and there is also indicated the openings 74 formed by mold pins.

The said conduit block C thus contains nine ducts 73, but it is easily seen that a block containing six ducts, or any number of ducts up to nine could be as easily formed merely by utilizing only the corresponding number of shafts 8 and packing heads *p*. Thus, the present machine has extreme versatility in that blocks of any number of ducts may be easily formed. Of importance in this invention is the fact that each of the shafts is provided with independent drive means, such as the related hydraulic motor *m*, or which might well be individual electrically powered motors. It should be noted that the hydraulic system of motors *m* is distinct from the system which operates cylinders 16, 16', 41, 41', and 69. Thus, the individual motors *m* assure effective and proper operation of each shaft so that the same will most definitely rotate at the predetermined timed, angular speed, and the system of sprockets and chains above described, further assures that the shafts 8 will operate in a uniform manner, so that the duct formation throughout the block *c* will be of consistent character.

Furthermore, the unique relationship between hopper box 35 and stripper plate 46 assures that the mold box B will be maintained in stable, rigid position during the molding operation and thus be resistant to any torque or other turning movements which might be developed during operation. The provision of the uniquely operated upper and lower mold pins also provides a distinct departure from machines heretofore known and the same serve to further stabilize the conduit block being formed during molding.

Thus, machine A is easily operated and is consistent and reliable in operation so as to produce conduit blocks of uniform character and of great strength and durability. Furthermore, the machine is so contrived that the molding operation may be substantially continuous so that maximum production may be achieved.

It should be understood that changes and modifications in the formation, construction, arrangement, and combination of the several parts of the conduit block making machine may be made and substituted for these herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A conduit block making machine adapted for receiving a mold box comprising a frame, a head adapted for vertical reciprocal travel along said frame, a plurality of individual prime movers carried on said head, an elongated, vertically presented shaft engaged to each prime mover for downward extension therefrom, a plurality of means for interconnecting said shafts for effecting uniform rotation thereof, each such means interconnecting less than the total number of shafts a packing head mounted on the lower extremity of each shaft, means located spacedly downwardly of said head for engaging the lower end of a mold box for supporting and positioning same for reception therein of the lower portions of said shafts, and means mounted on said frame for clampingly engaging the upper end portion of the mold box.

2. A conduit block making machine as described in claim 1 and further characterized by said prime movers being hydraulic motors, and control means for energizing selected of said motors for effecting rotation of the associated shafts.

3. A conduit block making machine adapted for receiving a mold box comprising a frame, a head adapted for vertical reciprocal travel along said frame, a plurality of prime movers carried on said head, an elongated, vertically presented shaft engaged to each prime mover for downward extension therefrom, a packing head mounted on the lower extremity of each shaft, means for supporting a mold box at the lower end of said frame for reception thereby of the lower portions of shafts during the molding operation, a hopper box carried on said frame for vertical reciprocal movement toward and away from the upper end of a mold box, a flat stripper plate disposed beneath said hopper box and carried thereby, and spring means biasing said stripper plate downwardly from said hopper box.

4. A conduit block making machine as described in claim 3 and further characterized by said hopper box and stripper plate having aligned openings for projection therethrough of the shafts, said stripper plate carrying members for engaging the upper end side portions of a mold box, said hopper box being rectangular and having its bottom surface in planar parallel relationship to the stripper plate.

5. A conduit block making machine as described in claim 4 and further characterized by depending mold pins carried by said hopper box for extension into the upper end portion of a mold box, there being openings in said stripper plate through which said mold pins extend.

6. A conduit block making machine as described in claim 4 wherein said hopper box and stripper plate are provided with aligned openings for projection therethrough of the shafts, means on said stripper plate for engaging side portions of a mold box disposed on said machine, hydraulic power means for lowering said hopper box into tight abutment upon the stripper plate in

stressing said biasing means for surface-wise engaging said stripper plate upon the upper end edges of a mold box.

7. A conduit block making machine adapted for receiving a mold box comprising a frame, a head adapted for vertical reciprocal travel along said frame, a plurality of prime movers carried on said head, an elongated, vertically presented shaft engaged to each prime mover for downward extension therefrom, a packing head mounted on the lower extremity of each shaft, means for supporting a mold box having relatively shallow mold pin-receiving openings, closed at their inner extremities, at its upper and lower ends provided at the lower end of said frame for reception thereby of the lower portions of shafts during the molding operation, a hopper box carried on said frame for vertical reciprocal movement toward and away from the upper end of a mold box, upper mold pins depending from said hopper box for extension into the upper portion of a mold box, a stripper plate being disposed below said hopper box and carried thereby for disposition upon the upper end of a mold box, said stripper plate having openings for projection therethrough of the upper mold pins, said spring means biasing said stripper plate in spacedly, downwardly relationship to said hopper box, lower mold pins projecting upwardly from and shiftably mounted upon projecting upwardly from the lower end of said frame for upwardly retractable movement through the mold box support means, and means for simultaneously inserting said upper and lower mold pins into the related openings of said mold box and withdrawing same therefrom.

8. A conduit block making machine adapted for receiving a mold box comprising a frame, a head adapted for vertical reciprocal travel along said frame, a plurality of individual prime movers carried on said head, an elongated, vertically presented shaft engaged to each prime mover for downward extension therefrom, a plurality of sprockets mounted on each shaft in aligned tiered arrangement, chains engaging selected sprockets of each tier for assuring uniform rotation of the inter-engaged shafts.

9. A conduit block making machine as defined in claim 8 and further characterized by each chain inter-engaging less than the total number of shafts.

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