May 15, 1956 R. E. WISSMAN 2,745,338

PRESS CONSTRUCTION

Filed Feb. 20, 1953 6 Sheets-Sheet 1

FIG-1

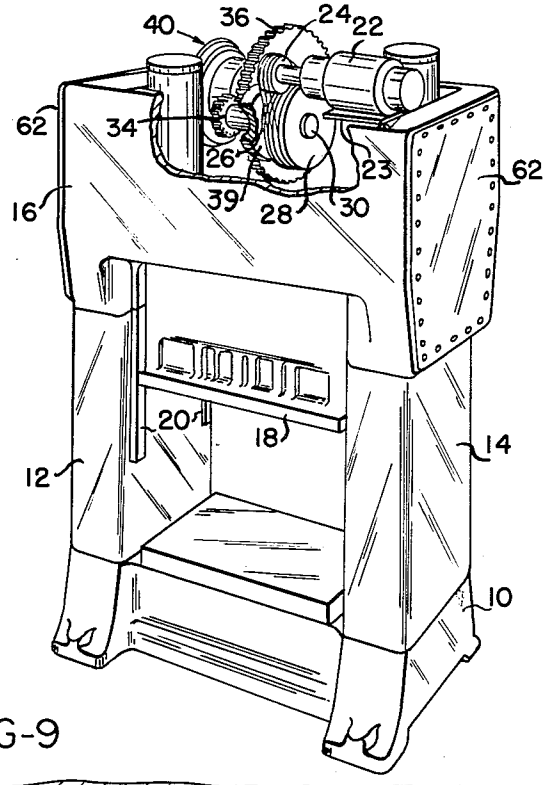


FIG-9

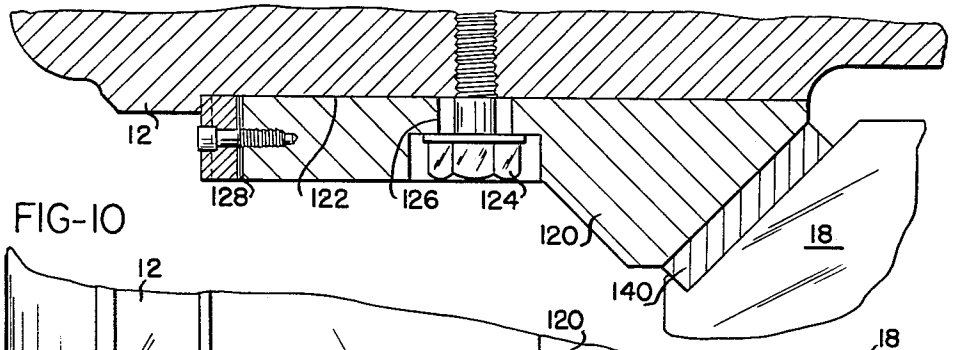
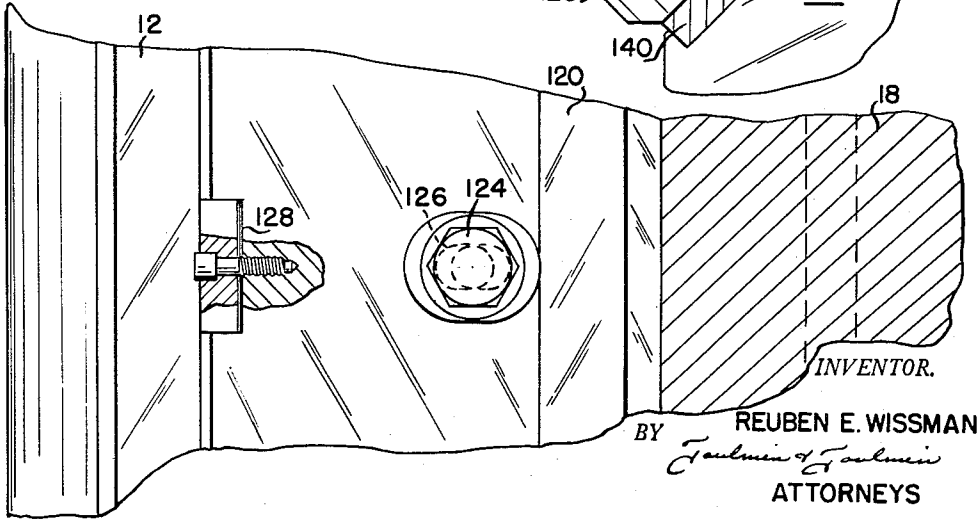


FIG-10



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PRESS CONSTRUCTION

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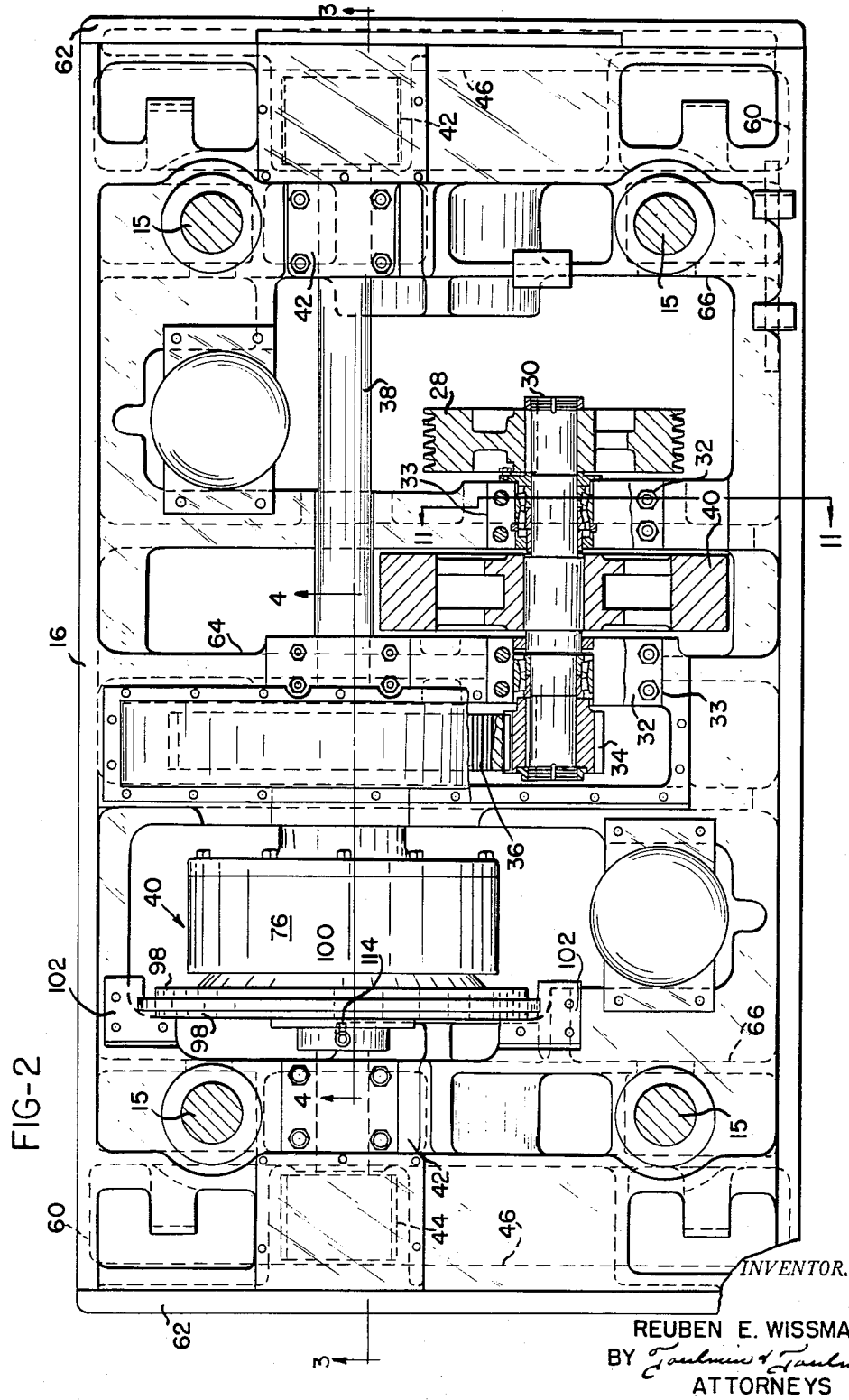


FIG-2

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PRESS CONSTRUCTION

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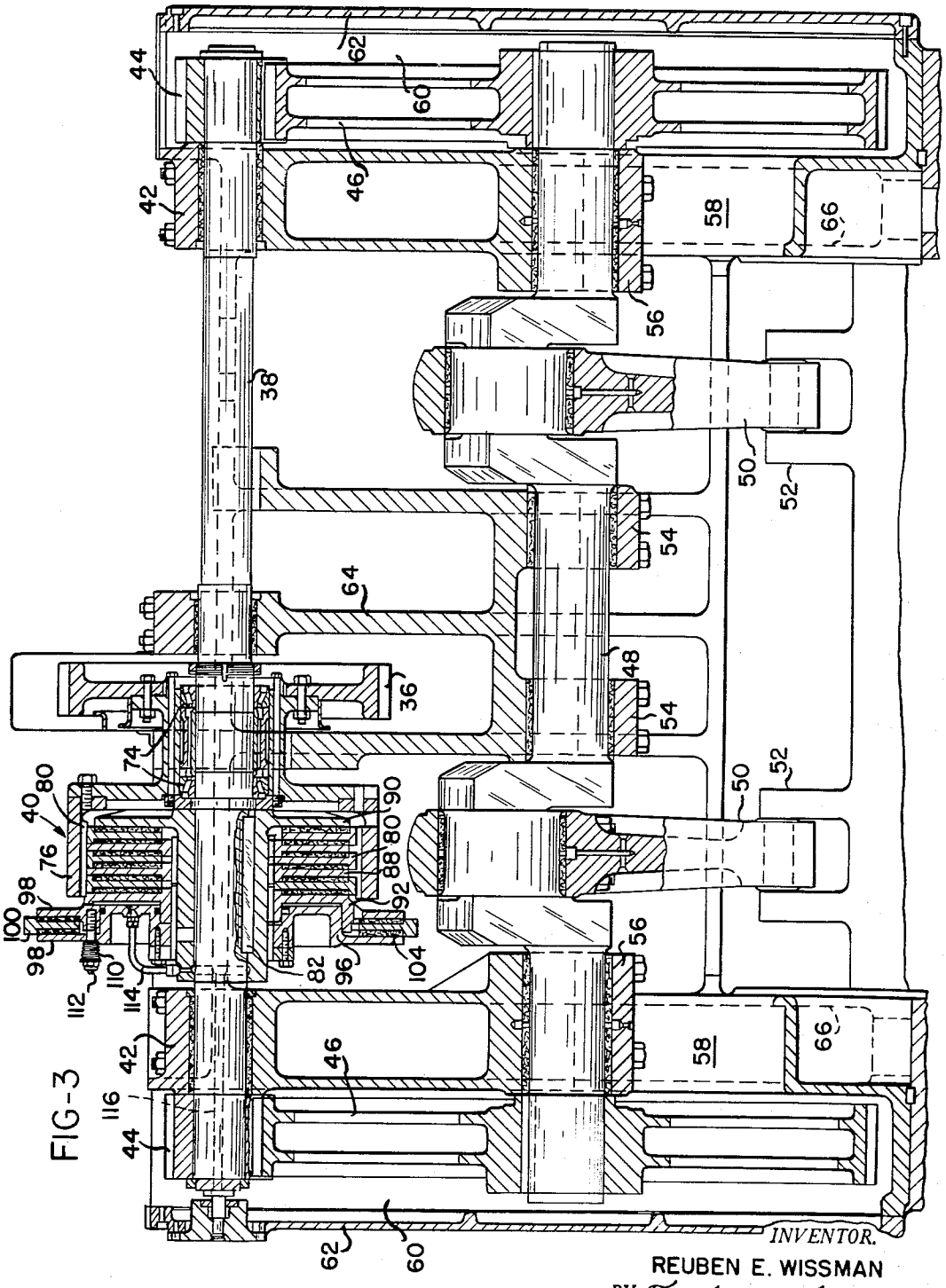


FIG-3

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PRESS CONSTRUCTION

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FIG-4

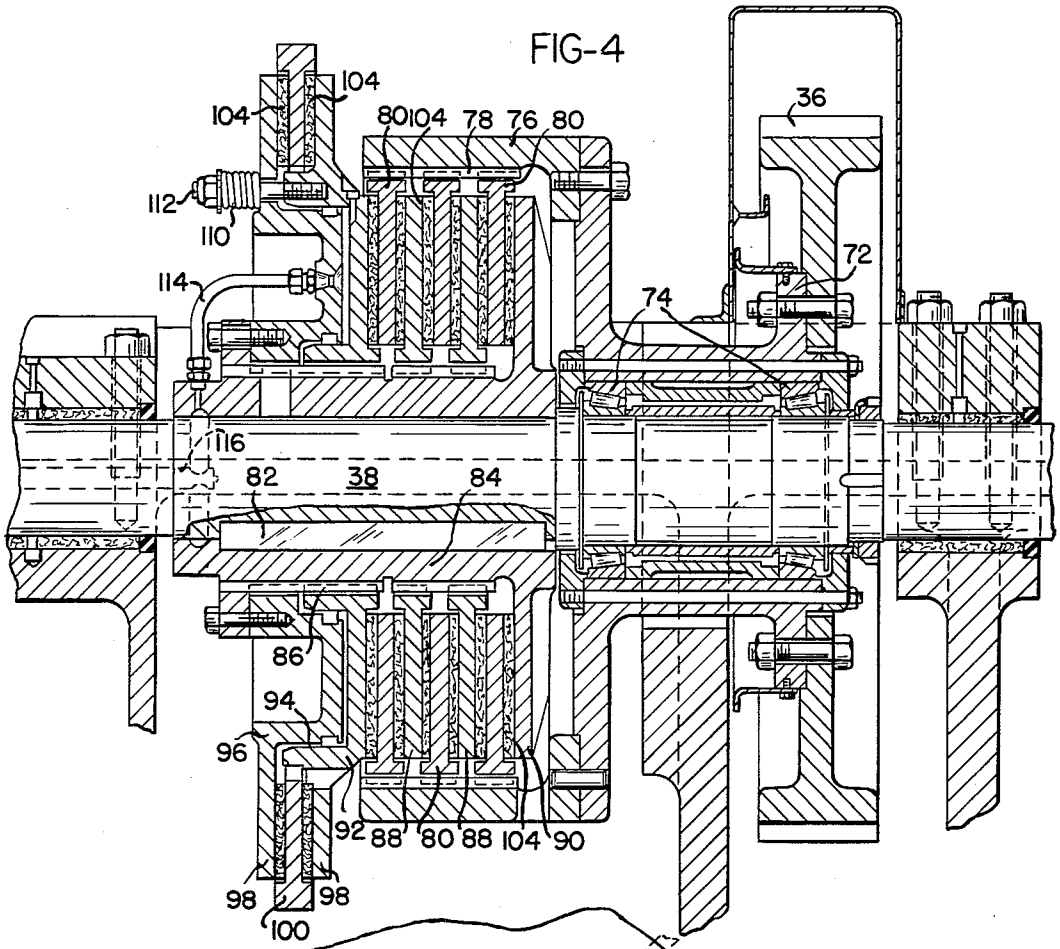
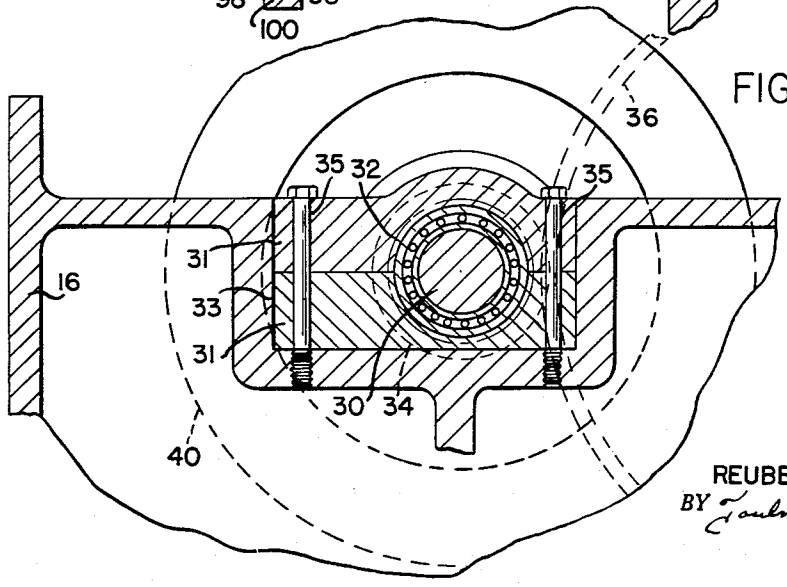


FIG-11



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PRESS CONSTRUCTION

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FIG-6

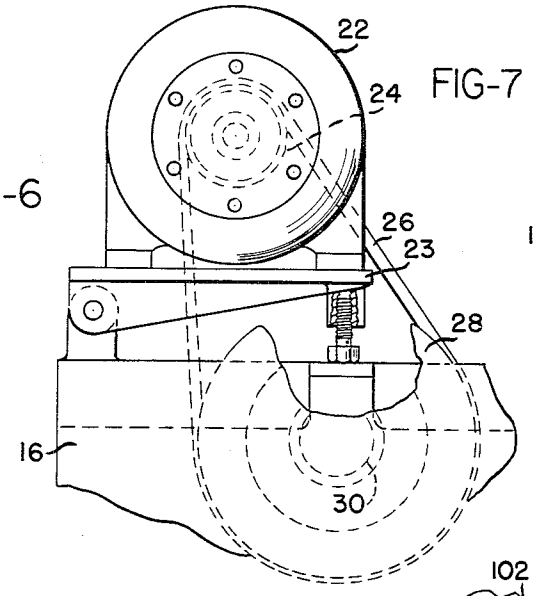


FIG-7

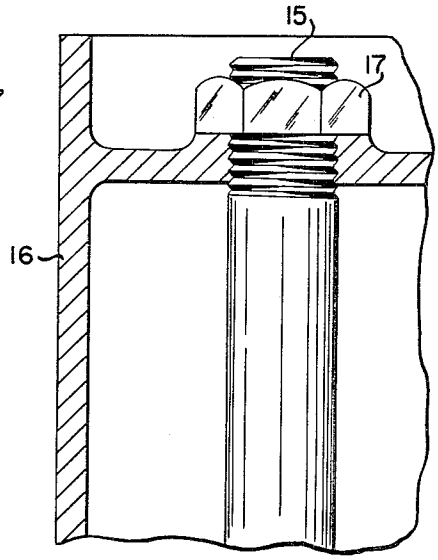


FIG-5

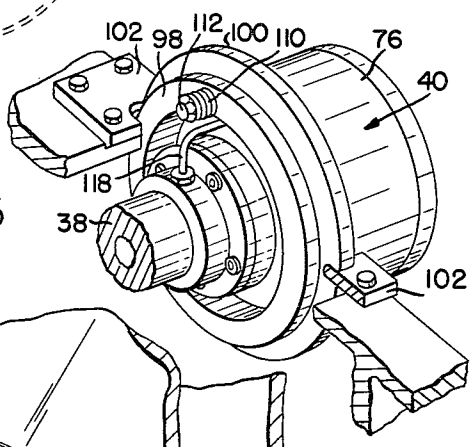
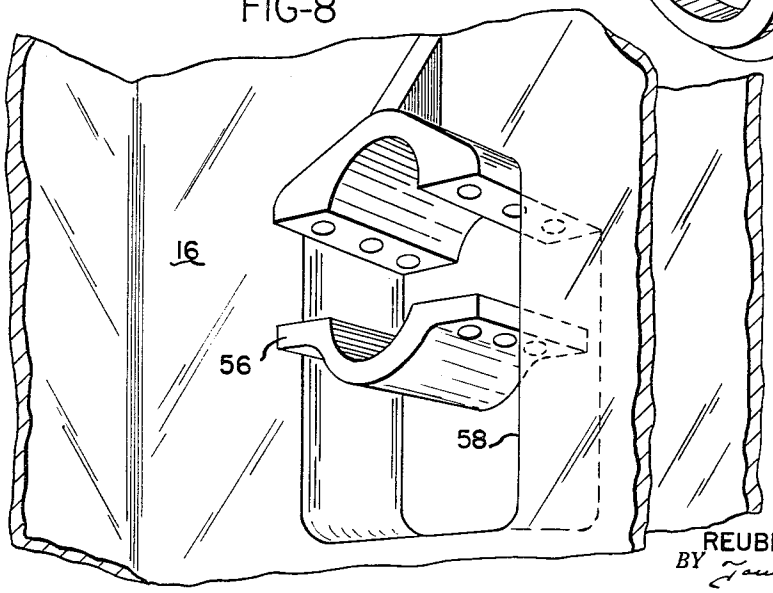


FIG-8



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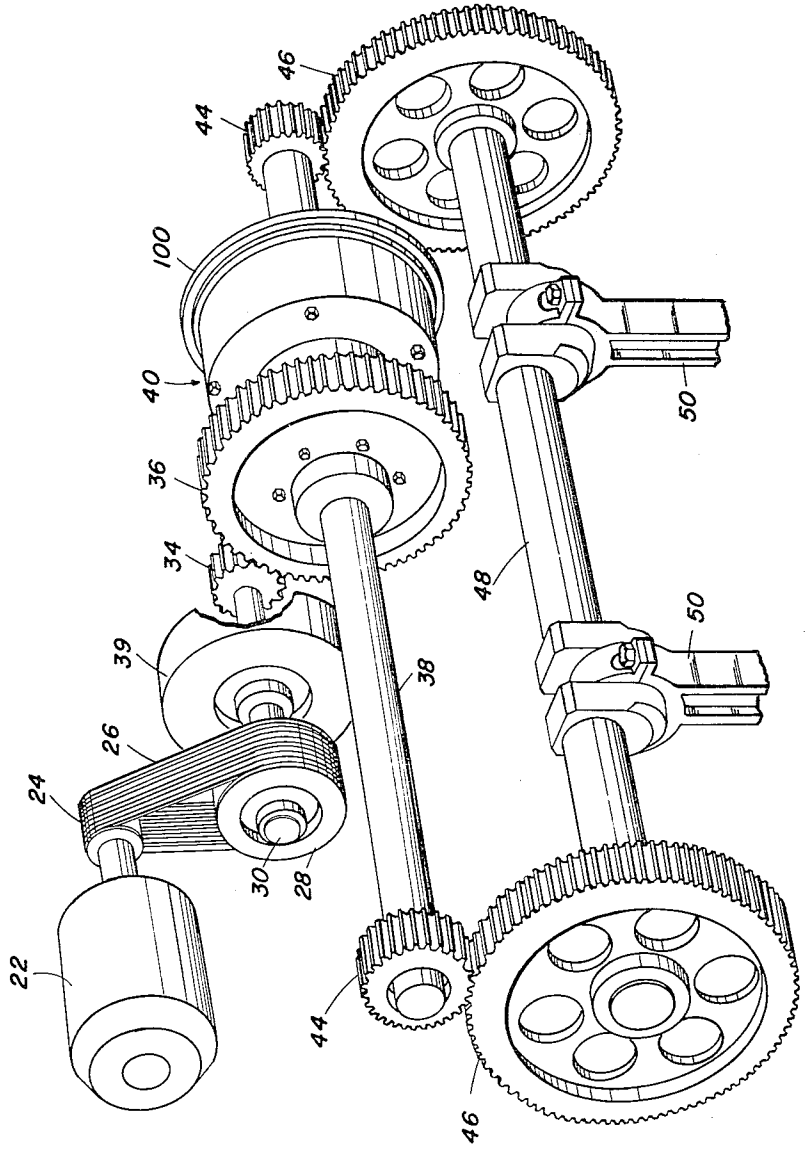
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May 15, 1956 R. E. WISSMAN 2,745,338

PRESS CONSTRUCTION

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Fig. 12



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United States Patent Office

2,745,338

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2,745,338

PRESS CONSTRUCTION

Reuben E. Wissman, Minster, Ohio, assignor to The Minster Machine Company, Minster, Ohio, a corporation of Ohio

Application February 20, 1953, Serial No. 337,977

4 Claims. (Cl. 100—282)

This invention relates to presses, particularly to mechanical presses, and especially to a new and improved construction for such presses involving the manner in which the crown of the press is constructed and arranged and the driving device for the press mounted therein.

Mechanical presses, in general, are constructed with a head and bed spaced apart by uprights at the sides thereof with a platen reciprocably guided within the uprights and with a power means for driving the platen mounted in the head or crown of the press. The usual type of power plant for driving the platen of the press consists of an electrical motor connected through suitable driving means, such as gearing, with a crankshaft that is connected with the platen by connecting rods. The crankshaft is usually driven by a large heavy gear which is clutched to the crankshaft for driving the crankshaft, and which is unclutched from the crankshaft while the crankshaft is braked in order to stop the crankshaft.

The mounting of the drive train between the drive motor and the crankshaft in a mechanical press of the general nature referred to is generally rather difficult, particularly where an attempt is made to locate the parts of the drive train where they can readily be serviced.

A particular disadvantage of mechanical presses heretofore has been the inflexibility of design thereof in that a press constructed to operate at some given speed could not readily be modified to provide for a different speed. Each press thus was adapted for operation over only a relatively limited speed range, and any substantial change in speed characteristics of a press had to be taken into account at the time of designing the structure.

In large mechanical presses having relatively long platens with two points of connection with the crankshaft, the particular problem arises of transmitting sufficient torsional effort to the crankshaft to accomplish the work for which the press is designed without introducing undue torsional stresses in the crankshaft. Such stresses arise when the crankshaft is driven from one end only and, accordingly, it is customary to drive such crankshafts from both ends. The driving of the crankshaft from both ends can be accomplished by locating clutches between the crankshaft and the large gears mounted theron, but the difficulty arises of synchronizing the clutches and the added expense is encountered of providing two entirely independent clutch and brake units together with the bearings, by means of which the gears are journalled on the crankshaft and the various other parts that must be duplicated. Accordingly, with presses of this nature it has been the practice to drive both ends of the crankshaft by gears mounted thereon and which are driven in unison by a transverse shaft having pinions on its opposite ends meshing with the large gears on the crankshaft, and with the controlling clutch and brake being located on a high speed drive shaft which is connected through reduction gearing with the said transverse shaft. This location of the clutch-brake unit imposes severe loads on the clutch and brake because of the high speed

of relative movement between the interengageable clutch parts and the interengageable brake parts, such that these parts are subjected to severe abuse at the instants of starting and stopping the press. In modern practice, where automatic loading and unloading devices are employed and the clutch and brake are operated in rapid succussion through substantially continuous cycling of the press, it is found that the clutch-brake unit has extremely short life leading to expensive replacement costs and expensive down time of the press during repairs.

According to the present invention, a novel structure has been devised whereby the advantage is obtained of locating the clutch-brake unit as near the load as possible, thus greatly reducing the amount of inertia load to be started and stopped thereby and, at the same time, reducing the relative speed between the interengageable clutch and brake parts that exists when the clutch-brake unit is mounted on the high speed drive shaft. This was accomplished by locating the clutch-brake unit on the intermediate transverse shaft, both ends of which are geared to the large gears that are rigid with the opposite ends of the crankshaft.

Having the foregoing in mind, it is a primary object of the present invention to provide a mechanical press construction in which the difficulties referred to above are avoided.

A still further object is the provision of a mechanical press having a power plant mounted in the head or crown thereof which can readily be serviced at any time.

A particular object is the provision of a mechanical press having an improved type crown so arranged that no gears project therefrom requiring unsightly housings and guards.

A still further object is the provision of a mechanical press in which the crown is so constructed that an oil sump integral therewith can be provided for the drive gear mounted on the crankshaft.

Another particular object of this invention is the provision of a mechanical press design which is adapted for readily having the speed of operation thereof changed at any time and in a simple manner.

A still further object of this invention is the provision of a press drive arrangement with a friction clutch-brake unit so located therein that the operating speed of the press can be changed without requiring any change in the clutch-brake unit.

These and other objects and advantages of this invention will become more apparent upon reference to the following specification taken in connection with the accompanying drawings, in which:

Figure 1 is a perspective view, partly in section, of a press constructed according to my invention;

Figure 2 is a plan view, partly broken away, looking down on top of the press;

Figure 3 is a transverse sectional view indicated by line 3—3 on Figure 2;

Figure 4 is a transverse sectional view indicated by line 4—4 on Figure 3;

Figure 5 is a fragmentary perspective view showing how the brake disk of the clutch-brake unit forming a part of the drive train of the press is held stationary;

Figure 6 is a fragmentary view showing how the drive motor of the press is mounted;

Figure 7 is a vertical sectional view located by line 7—7 on Figure 2 showing the upper end of one of the strain rods of the press;

Figure 8 is a fragmentary perspective view showing the manner in which bearings are provided for the ends of the crankshaft;

Figure 9 is a fragmentary plan sectional view showing

the manner in which one corner of the platen is guided on the uprights of the press;

Figure 10 is a front elevational view of the platen guiding arrangement of Figure 9; and

Figure 11 is a sectional view on line 11—11 of Figure 2 showing a bearing support for one of the shafts of the drive train.

Figure 12 is an isometric perspective view illustrating the arrangement of the motor, flywheel and shaft, intermediate shaft with brake and clutch and crankshaft with associated gearing.

Referring to the drawings somewhat more in detail, in Figure 1 a press construction according to my invention is illustrated, and it will be seen that this comprises a bed or base casting 10 on which rest the spaced uprights 12 and 14 and on the upper ends of which there is mounted a head or crown 16. Strain rods 15 having nuts 17 (Figures 2 and 7) connect the crown, bed and uprights together.

Platen 18 is reciprocably guided along the uprights 12 and 14 as by the guiding means 20 extending along the uprights, and power means are mounted in the crown of the press for supplying power for reciprocating the said platen.

The arrangement of the driving means in the crown of the press will be more clearly seen in Figures 2, 3 and 6.

In these last mentioned figures it will be noted that the crown of the press is hollow and has ribbing and partitions therein so that space is provided for receiving shafts, pulleys, gears and the like.

A drive motor 22 mounted on a tiltable platform 23 on top of the crown of the press drives a pulley 24 over which a plurality of V-belts or other flexible driving elements 26 pass. Elements 26 also pass around a pulley 28 mounted rearwardly of the center line of the crown of the press on the end of a shaft 30.

Shaft 30 is supported on the crown of the press in the spaced bearings 32 which are located on the upper ends of two of the partition walls formed within the crown of the press. At the end of shaft 30 opposite pulley 28 there is mounted a pinion 34 that meshes with a gear 36 that is rotatably carried by an intermediate shaft 38 extending transversely of the press crown and located somewhat forwardly of the center line of the crown.

An important feature of this invention resides in the arrangement of shafts 30 and 38 and the bearings 32 for shaft 30. Bearings 32, as will be seen in Figure 11, comprise block members 31 that are received in recesses 33 in the partition walls of the press crown. The block members are split to receive the antifriction bearings that directly support the shaft 30, and studs 35 extending up from the bottom walls of the recesses provide the means for retaining the block members in fixed assembled position. However, should it be desired to change the speed of the press, a larger gear than gear 36 can be placed on shaft 38, and the block members 31 reversed in their respective recesses to provide for the proper center to center distance for shafts 30 and 38.

A fly wheel 39 is mounted on shaft 30 between bearings 32, and the function of fly wheel 39 is to store energy when the platen of the press is stationary and to release this stored up energy to the platen during a working stroke thereof.

One of the important features of the present invention will be evident at this point, and this feature concerns the mounting of pulley 28 on the extreme end of shaft 30. This constructional feature makes it a simple matter to replace the V-belts or flexible driving elements 26 and permits the use of endless molded V belts without any disadvantage.

The gear 36 that is driven by pinion 34 is adapted for being selectively clutched to shaft 38 by operation of a clutch-brake unit generally indicated at 40 and which will be described more in detail hereinafter.

Referring particularly to Figures 2 and 3, it will be noted that shaft 38 is journalled at spaced points along the top of the crown of the press at the end partition walls thereof by bearings 42. Shaft 38, at its outer ends, has the pinions 44 mounted thereon which mesh with the large gears 46 that are secured to the opposite ends of crankshaft 48.

The crankshaft 48, as will best be seen in Figure 3, has spaced throws thereon receiving the ends of connecting rods 50 which extend to and are pivotally connected with platen 18 as at 52.

The central part of crankshaft 48 is supported by bearings mounted at the bottom of center partitions in the press head, these bearings being identified by reference numeral 54 in Figure 3, while the outer ends of the crankshaft inwardly of the gears 46 are supported in bearings 56, the construction of which is illustrated more in detail in Figures 2 and 8. In these last mentioned figures it will be noted that the end partitions or walls of the crown are provided with elongated openings 58 of a size to receive the crankshaft 48 by axial movement thereof into the press crown. The upper ends of the apertures 58 form one-half of the bearings 56 and the lower one-half of the bearings 56 take the form of detachable caps.

As will best be seen in Figure 3, each end of the press crown comprises a recess 60 in which one of the gears 46 is positioned. These recesses 60 are adapted for being closed by a cover plate 62 so that the gears are at one time guarded by being in a closed compartment, and at the same time can run in a pool of oil thus providing for adequate lubrication of the gears at all times.

In connection with the compartments referred to above, Figure 3 will serve to reveal that the crown of the press is formed with the center transversely extending part 64 positioned above the platen of the press and the side parts 66 positioned above the uprights 12 and 14, and which side parts extend downwardly below center part 64 so that compartments 60 are formed completely within the crown of the press. This construction of the press crown, which forms an important feature of the present invention, is of advantage over previous constructions in that the gears at the ends of the crankshaft do not project beyond the sides of the press, but are, rather, located within compartments in the press crown and which compartments are completely within the press crown and do not extend down into the uprights of the press whereby a joint in the compartments is eliminated.

The elimination of the joint in the compartments which would customarily appear at the upper ends of the uprights is of importance because casting problems are reduced, and the problem of making an oil-tight joint between the press crown and the uprights is likewise eliminated. The uprights of the press, according to this invention, can be relatively simple, and regular castings and casting complexities attendant the forming of the compartments for the gears 46 are all confined to the construction of the press crown.

According to the present invention, therefore, the press can be more quickly and readily assembled and there is no possibility that, during use of the press, the joint between the crown and the uprights will become sprung or commence to leak whereby the lubricating fluid for the gears 46 might become lost.

The clutch-brake unit 40 is illustrated in some detail in Figure 4, although it will be understood that the unit shown therein is merely exemplary of a number of such clutch-brake devices that could be employed. The clutch may be of the type disclosed in United States Patent 2,180,218, issued to the same named inventor. In Figure 4 the gear 36 is bolted to hub 72 which is journalled on shaft 38 by bearings 74. Hub 72 has a flange connected rigidly with a clutch shell 76 having spline means 78 on which clutch plates 80 are slidably mounted.

Shaft 38, in turn, has keyed thereto, as indicated by key 82, a hub member 84 having external splines 86 on which are slidably mounted the movable clutch plates 88

that are interleaved with clutch plates **80**. Hub **84** also comprises the clutch plate **90** stationary thereon at the right end thereof. Still another plate at the left side, identified at **92**, forms a cylinder **94** for receiving the annular piston **96**. Plate **92** also extends radially outwardly and forms one of two spaced brake plates **98**, the other of which is integral with piston **96**. Disk **100**, between plates **98**, is provided with notches (Figure 5) which receive the edges of brackets **102** mounted in the crown of the press thereby rigidly to hold plate **100** against rotation while at the same time permitting some axial movement thereof.

Friction disks **104** are provided between the several clutch plates and brake plates for effecting frictional engagement therebetween. Springs **110**, acting on studs **112**, normally make the clutch ineffective and urge the brake plates into braking engagement. A supply of pressure fluid delivered to cylinder **94** through the conduit means **114** and passage **116** in shaft **38** is operable to force the clutch plates into frictional engagement while simultaneously disengaging the brake plates.

According to known practices, a conduit connected to passage **116** by a rotary joint can be employed for supplying pneumatic pressure to the passage or exhausting the passage as by a solenoid operated valve in the conduit. The pressure of this supply can be regulated and controlled so the clutch will act as a safety link in the drive train and slip upon the platen encountering a predetermined overload.

In this connection, the location of the clutch according to this invention is important because the clutch operates at a much slower speed than it would if it were on the high speed shaft **30** and the inertia mass which it must accelerate at the time of starting the press is much smaller. The clutch, accordingly, is considerably less abused in the location according to the present invention than it would be if it were mounted on the high speed drive shaft **30**.

Another important advantage obtained from locating the clutch-brake unit **40** on the intermediate shaft **38** is that in making speed changes in the press the clutch-brake unit is much less affected than if it were located on the high speed drive shaft **30**. For example, in a press adapted for operation over a wide range of speeds, the clutch must be capable of delivering full tonnage at the lowest speed, and with the clutch located according to the present invention no change in the structure thereof is necessary to accommodate to the higher speed.

At the same time the location of the clutch-brake unit according to this invention on the intermediate shaft **38** between the flywheel **39** and the crankshaft has definite advantages in connection with starting and stopping the press platen and with the action of the press during a period of overload.

As to the starting of the press, at the instant of closing the clutch the stationary mass on the output side of the clutch must be accelerated to operating speed, and during this interval the clutch experiences its severest service. By placing as much of the drive train as is practicable on the input side of the clutch the inertia load, consisting of the platen and crankshaft and the portion of the drive train between the clutch and crankshaft, that must be set in motion by the clutch upon closing thereof, and stopped upon closing the brake, is kept at a minimum.

Similarly, upon opening the clutch and setting the brake, the same inertia load must be brought to a halt and this is more readily accomplished with the brake located according to this invention than if a greater inertia load were located between the brake and the platen.

As to the slipping of the clutch under conditions of overloading of the platen, the location of the clutch on the intermediate shaft places most of the inertia of the rotating parts on the input side thereof whereby, under the conditions when the clutch will slip, the shafts and gearing on the output side thereof are protected and cushioned from

the loads that would be imposed thereon if the halting or slowing down of the platen under overload conditions would also have to stop or slow down a direct connected inertia load that also included the inertia load of the parts mentioned above.

While the clutch-brake unit, located according to this invention, offers the advantages referred to above it offers also an advantage over the location thereof at a still higher speed location in that no problems of heat dissipation arise with the unit of this invention in the described location. The unit is of adequate size to dissipate all of the generated heat so as to prevent heat damage to the clutch and brake facings while still being sufficiently small to permit economical manufacturing.

It will be seen that the clutch-brake unit provides means for selectively clutching gear **36** to shaft **38** and for unclutching the gear from the shaft while simultaneously locking the shaft against rotation.

At this point reference may be had to Figure 2, wherein it is to be noted that all of the drive train loading from motor **22** to gears **46** is accessible from above the press so that at any time service on the press is required, such as adjustment, replacement or repair of the clutch-brake unit, it can readily be accomplished in the simplest possible manner. This is of advantage, not only in the construction of the press, but also in the maintenance thereof.

It has been mentioned that the platen is guidable along the uprights **12** and **14** during its reciprocatory movement in the press, and a detail of this guiding arrangement is illustrated in Figures 9 and 10.

Each of the uprights **12** and **14** preferably has one guiding surface formed thereon by a fixed but detachable gib, while the other guiding surface is provided by a detachable and adjustable gib. In Figures 9 and 10 a detachable and adjustable gib is illustrated at **120**, and it will be seen to extend parallel to a machined surface **122** on the inner face of upright **12** and to be adjustably retained in position on the upright by cap screws **124** that extend through slots **126** in the gib and into threaded engagement with upright **12**.

The position of gib **120** on the upright may be adjusted by the provision of shimmed spacers **128** spaced along machined surface **122** between it and gib **120**.

It will be apparent that gib **120** can be adjusted relative to spacers **128** either toward or away from the corresponding guiding surface **140** on platen **18** to get a close fit of the gibs against the corners of the platen.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions, and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. A press of the character described, having a frame and a platen mounted for reciprocation thereon, and a drive motor for operating mechanism to actuate the platen, in combination with a flywheel and flywheel shaft driven by the motor at a predetermined speed, an intermediate clutch and brake shaft with a friction plate clutch and brake mounted thereon having a gear driven from said flywheel shaft at a lesser speed than the flywheel shaft, a pinion on said intermediate shaft, a crankshaft, gear means thereon for engaging the pinion on the clutch and brake shaft whereby the crankshaft is operated at a speed lower than the intermediate clutch and brake shaft whereby the clutching and braking function is performed at relatively slow speed as contrasted to the speed of the flywheel shaft.

2. A press of the character described, having a frame and a platen mounted for reciprocation thereon, and a drive motor for operating mechanism to actuate the platen, in combination with a flywheel and flywheel shaft driven by said motor at a predetermined speed less than that of the motor, an intermediate clutch and brake shaft having at least one gear means at each end, said clutch being of

the friction plate type and said clutch and brake shaft being driven from said flywheel shaft at a lesser speed than the flywheel shaft, a crankshaft, and gear means at each end of the crankshaft larger than the gear means at each end of the clutch and brake shaft and meshing therewith whereby the speeds of the motor, flywheel shaft, clutch and brake shaft and crankshaft are progressively lower from the motor to the crankshaft.

3. A press of the character described, having a frame and a platen mounted for reciprocation thereon, and a drive motor for operating mechanism to actuate the platen, in combination with a flywheel and flywheel shaft driven by said motor at a lower speed than the motor speed, a pinion on said flywheel shaft, an intermediate clutch and brake shaft with a friction plate clutch and brake thereon, a gear on the intermediate shaft engaging said pinion on the flywheel shaft adapted to drive the brake and clutch shaft at a slower speed than the flywheel shaft, pinions on either end of said clutch and brake shaft, a crankshaft, gears on either end of said crankshaft engaging the said pinions on said brake and clutch shaft whereby the speed of the crankshaft is materially slower than that of the brake and clutch shaft and the brake and clutch shaft is materially lower in speed than the flywheel shaft, whereby the braking and clutching and declutching can be effected at lower speeds.

4. A press of the character described, having a frame and a platen mounted for reciprocation thereon, and a drive motor for operating mechanism to actuate the platen, the combination of a flywheel and flywheel shaft driven

by the motor, an intermediate clutch and brake shaft carrying a friction plate clutch and brake, a crankshaft, said motor being arranged to drive the flywheel shaft with its flywheel, the intermediate clutch and brake shaft and the crankshaft through interconnecting gearing so that the flywheel shaft will rotate at high speed and the crankshaft will rotate at low speed and the brake and clutch shaft will rotate at an intermediate speed while still being in the line of power from the motor to the crankshaft to permit clutching and declutching at a lower speed than the motor speed and at not as low a speed as the crankshaft to save wear on the clutch, brake and gearing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,211,551	Curtis	Jan. 9, 1917
1,811,655	Smitmans	June 23, 1931
1,878,149	Johnston	Sept. 20, 1932
1,980,166	Rode et al.	May 22, 1934
1,981,167	Frost	Nov. 20, 1934
2,065,820	Mellon	Dec. 29, 1936
2,284,303	Rode et al.	May 26, 1942
2,366,272	LeTourneau	Jan. 2, 1945
2,494,921	Weiland	Jan. 17, 1950
2,523,393	Rhodes	Sept. 26, 1950
2,535,842	Criley	Dec. 26, 1950
2,581,022	Japikse	Jan. 1, 1952
2,693,158	Danly et al.	Nov. 2, 1954