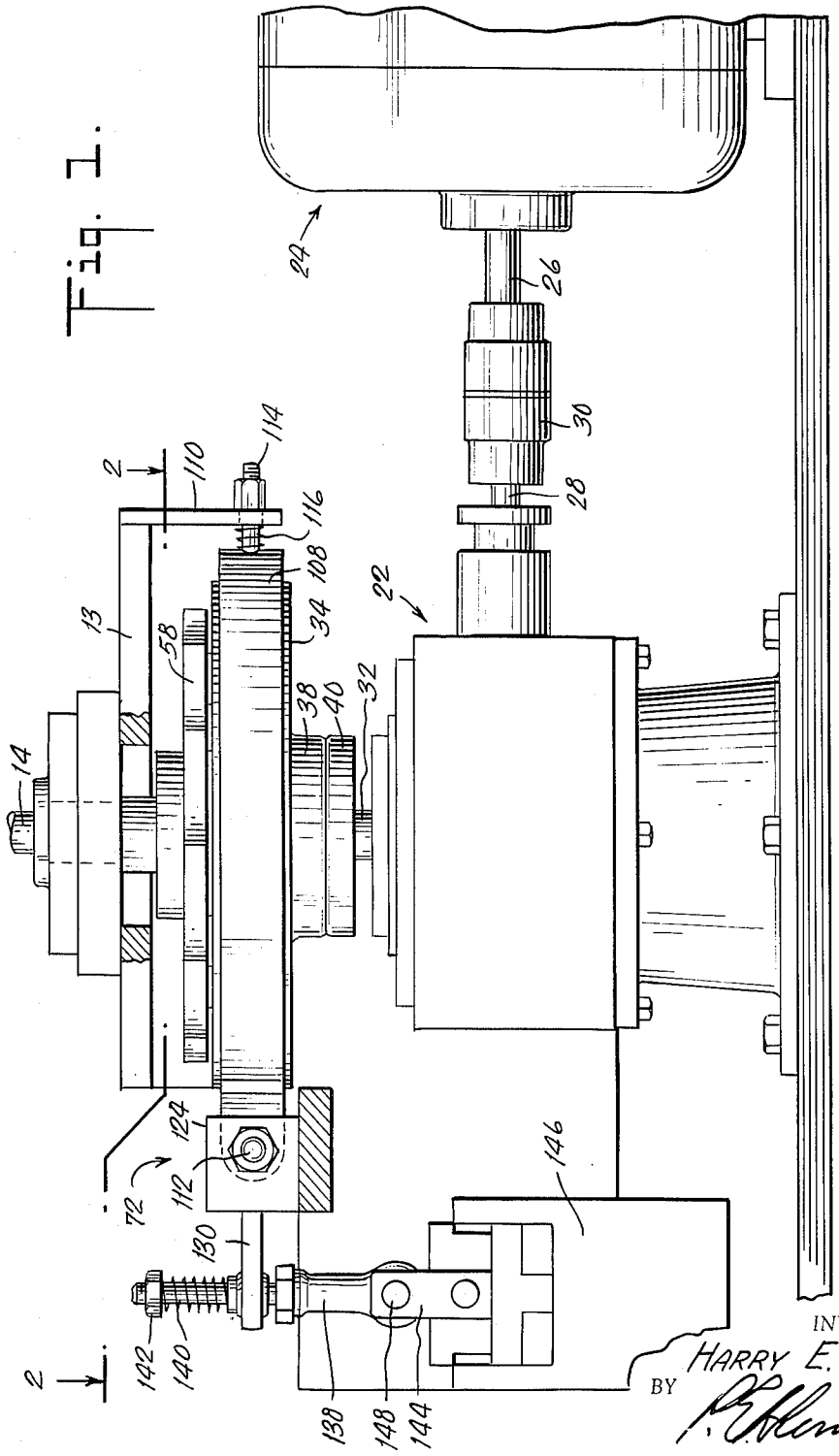
March 22, 1966 H. E. THORNTON 3,241,656

DIAL FEED FOR PRESSES

Filed April 9, 1964 5 Sheets-Sheet 1

Fig. 1.



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DIAL FEED FOR PRESSES

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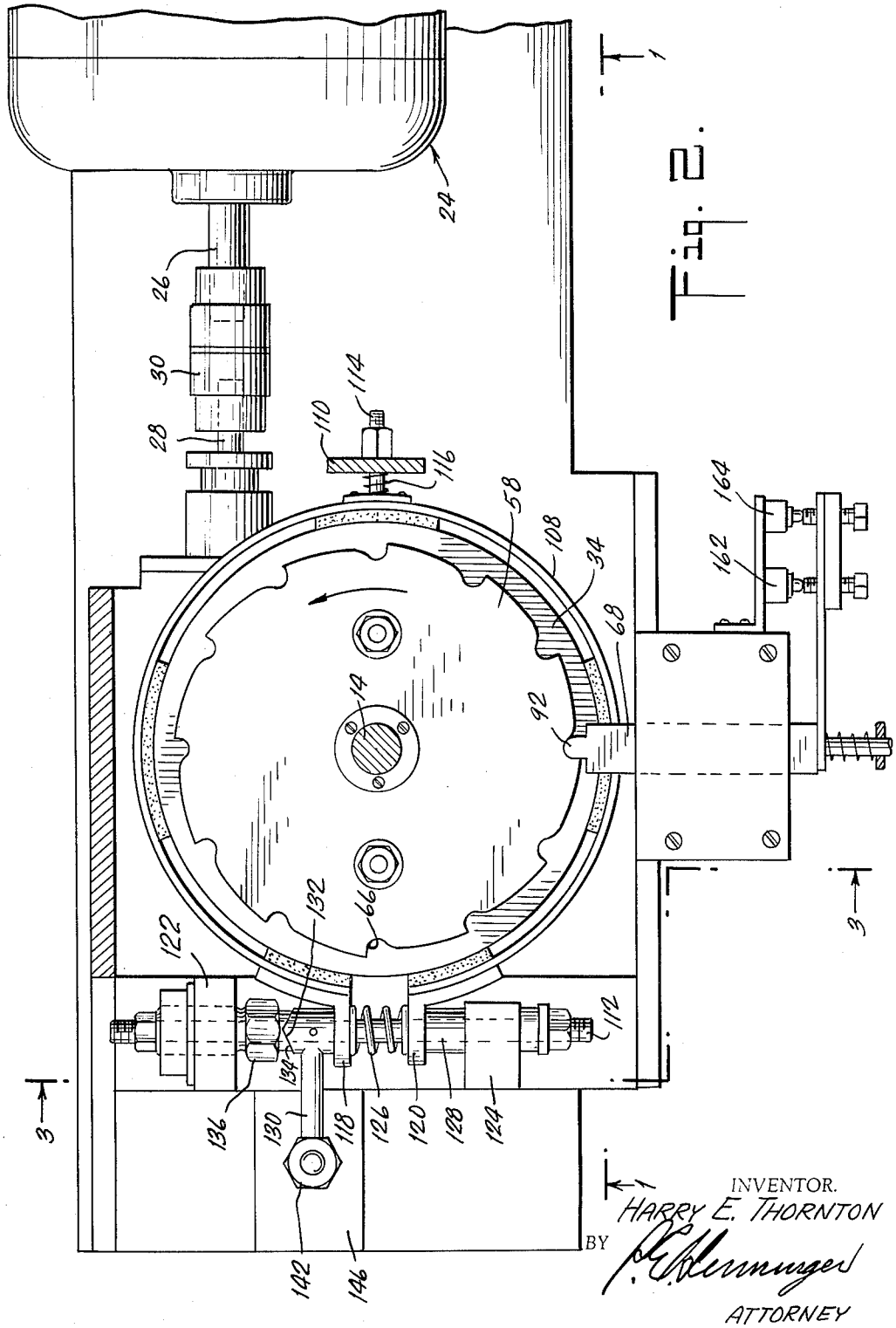


Fig. 2.

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DIAL FEED FOR PRESSES

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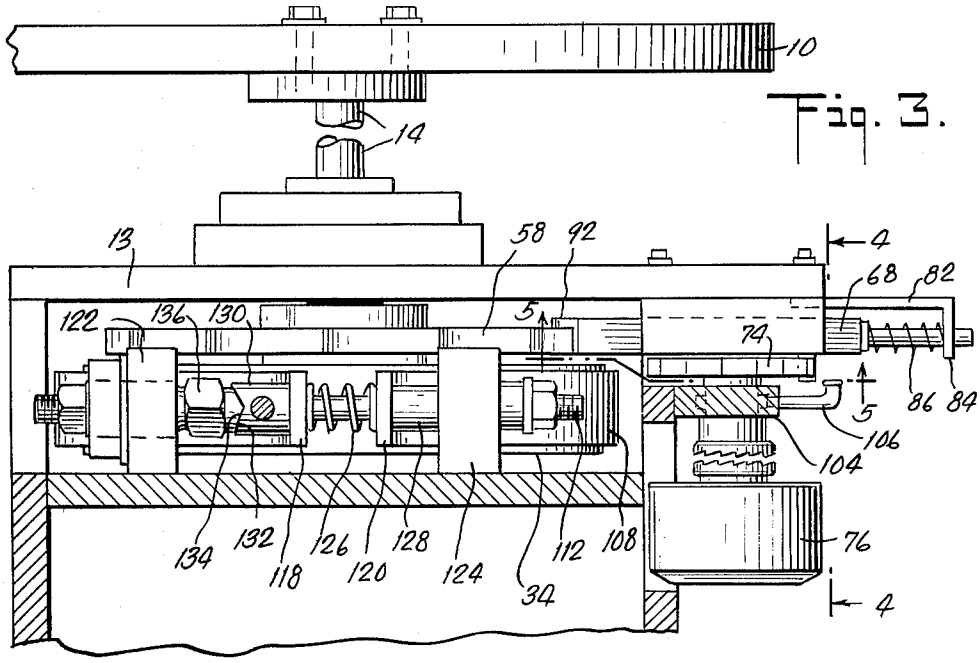


Fig. 3.

Fig. 4.

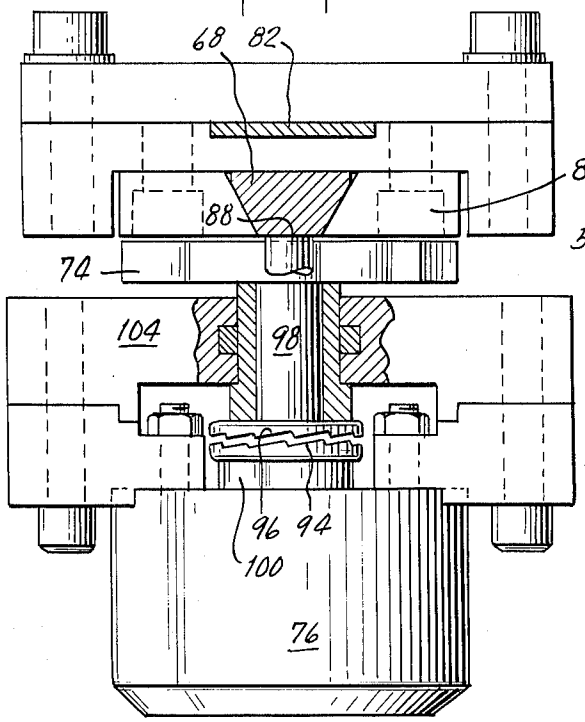
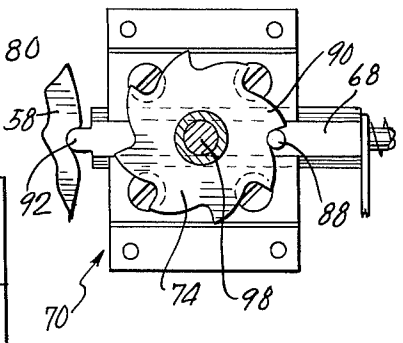


Fig. 5.



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DIAL FEED FOR PRESSES

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Fig. 6.

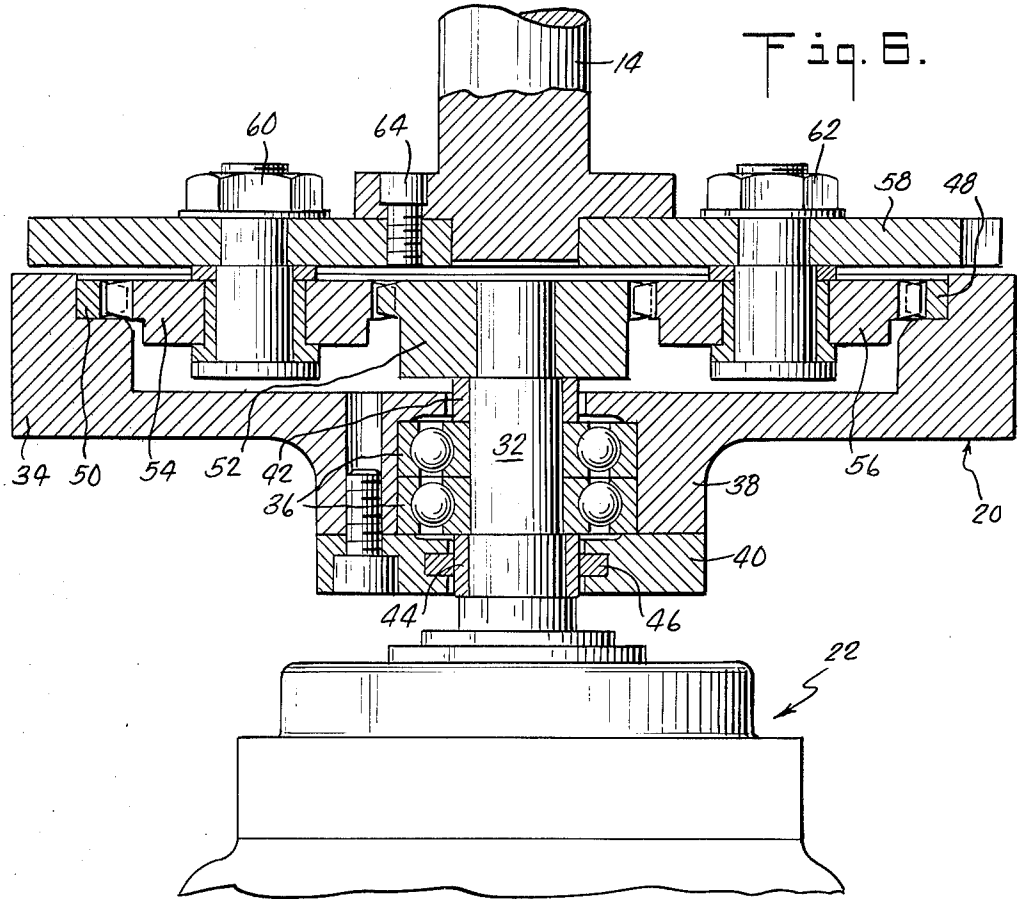


Fig. 7.

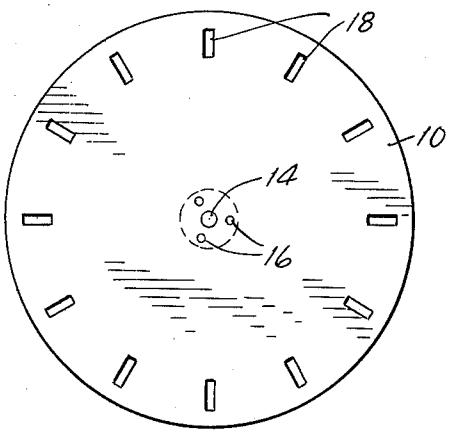
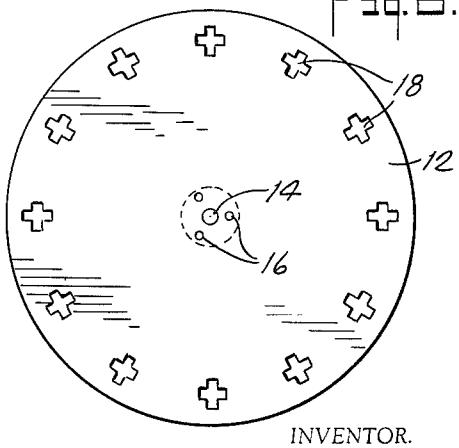


Fig. 8.



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DIAL FEED FOR PRESSES

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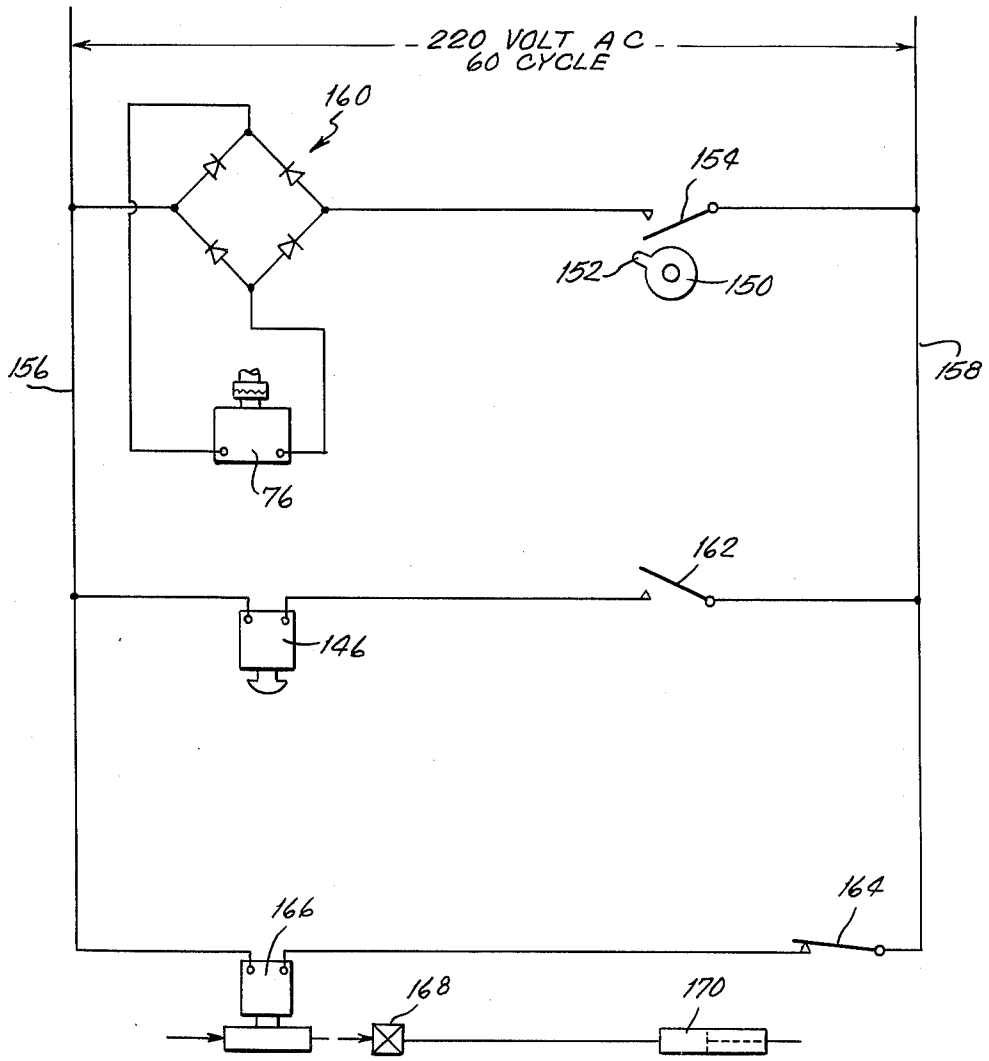


Fig. 9.

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United States Patent Office 3,241,656 Patented Mar. 22, 1966

3,241,656

DIAL FEED FOR PRESSES

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Filed Apr. 9, 1964, Ser. No. 358,536
9 Claims. (Cl. 198—209)

This invention relates to feed mechanism for presses. More particularly, the invention relates to mechanism for feeding metal components, particularly irregularly shaped, sintered, powdered metal, structural parts into a sizing die for cold coining and the subsequent transfer of the sized parts to a discharge point.

In its broad aspect, the invention comprises a press feeding mechanism providing a feed disk or dial having a plurality of workpiece sockets spaced about its periphery, said disk or dial having means for intermittently rotating the same to bring each of said sockets successively into a work zone where the feed disk or dial is latched against rotation as the press operates on the workpieces, and press controlled means for releasing the latching mechanism between press strokes.

In its more particular aspects, the invention provides a workpiece feeding disk or dial having a plurality of workpiece sockets spaced around its periphery, the disk or dial being adapted to carry workpieces from a loading station to a work station where a sizing or coining operation is performed on the workpieces, and from thence to a discharge station. The feeding disk or dial is connected to indexing means for rotating the feed disk or dial between press strokes and for positively latching it against rotation when the workpiece sockets are rotated into the work zone. In a specific embodiment, an electromagnetic release has been provided for the indexing mechanism in combination with a press control system which prevents the press from operating whenever the feed disk is released for rotation.

It is a specific object of the invention to provide a feeding adjunct for a sizing or coining press which adjunct is adapted to receive a succession of components at a point remote from a press work zone into which the components are delivered and at which the components are processed by the press, and which then delivers the processed components from the work zone to a discharge point which is also remote from the work zone.

It is still a further object of the invention to provide a very simple press feeding mechanism which employs interchangeable workpiece feeding dials, whereby workpieces of a great variety of shapes and forms may be processed in a completely safe and expeditious manner.

These and further objects and advantages of the invention will become apparent from a reading of the following description which is illuminated by the drawings, in which drawings like reference numerals indicate like parts, and in which:

FIG. 1 is a side elevational view of a dial feed drive mechanism, taken on line 1—1 of FIG. 2;

FIG. 2 is a plan view of the mechanism, taken on line 2—2, of FIG. 1;

FIG. 3 is a fragmentary side elevational view showing certain of the control mechanism, parts being shown in section and other parts in full line, and being taken on line 3—3 of FIG. 2;

FIG. 4 is an end elevational view of an indexing control pawl and ratchet mechanism, taken on line 4—4, of FIG. 3;

FIG. 5 is a plan view of the mechanism of FIG. 4, taken on line 5—5 of FIG. 3;

FIG. 6 is a cross-sectional view through a planetary drive mechanism;

FIGS. 7 and 8 comprise plan views of dial feed plates on a reduced scale; and

FIG. 9 is a diagrammatic representation of the control circuit.

Typical dial feed plates 10 and 12 are shown in FIGS. 7 and 8. These plates are adapted to overlie the bed of a sizing or coining press. The plates 10 and 12 are removably attached to a drive shaft 14 by means of machine screws 16. The drive shaft 14 extends upwardly through the bed plate of the press and it is connected to driving and control mechanism located beneath the bed plate of the press. The latter driving and control apparatus is designed to rotate the dial feed plate in step-by-step progression from a workpiece loading point to a work zone and then to a discharge point, thus avoiding the necessity for the press operator to feed workpieces directly into a die cavity in the vicinity of the press ram.

The dial feed mechanism is particularly useful for the feeding of irregularly and oddly shaped workpieces. Adapting each plate to feed workpieces of a particular configuration are a plurality of spaced sockets 18, conformed to the shape of the workpieces, formed at regular intervals about its periphery. Thus, the workpiece can be fed by hand into the sockets at a loading station which is remote from the work zone. As it is then intermittently stepped, the dial feed plate will carry the workpiece to the work zone where a coining or pressing operation is performed upon the workpieces by the descending press ram. Thereafter, as the dial feed plate continues to rotate between each of the press strokes, the processed workpiece will be carried away from the work zone for discharge adjacent the work loading station. The dial feed plates 10 and 12, which differ from each other only in the size and shape of the sockets 18, are representative of an entire series of such plates which may be easily produced for the feeding of a great variety of differentially shaped workpieces.

A dial feed plate, such as the plate 10 or plate 12, as stated, is driven and controlled through a planetary gear assembly 20, a speed reducer 22 and a motor 24. The motor 24, in a practical installation now in operation, is a 1750 r.p.m. three-quarter horsepower motor. The output shaft 26 of the motor is coupled to the input shaft 28 of the speed reducer, the latter in the practical installation above mentioned is a Boston Gear Company VA–10 speed reducer having a 9.75:1 ratio. The coupling between the motor shaft 26 and the input shaft of the speed reducer is preferably a flexible coupling 30, as shown in FIG. 2.

The output shaft 32 (FIG. 6) of the speed reducer 22 has rotatably mounted thereon a planetary gear housing 34. The housing is an upwardly opening dished structure adapted to receive and generally enclose a planetary gear system. The housing 34 is supported on the reducer shaft 32 by means of anti-friction bearings 36 disposed within an enlarged hub 38 of the housing. A bearing cap 40, spacers 42 and 44 and a sealing ring 46 complete the mounting structure for the housing.

Within the housing 34 is an annular ring gear 48 seated on and fixed to a shoulder 50 at an open face of the housing. Fixed to the shaft 32 of the speed reducer for rotation therewith is a sun gear 52. Interposed between the ring gear 48 and the sun gear are a pair of planet gears 54 and 56; the assembly of gears thereby constituting a planetary gear arrangement.

The sun gears 54 and 56 are carried by an index plate 58. The index plate 58 overlies the open face of the gear housing 34 and supports the sun gears 54 and 56 from the lower face thereof by means of stud bearings 60 and 62, respectively. The dial feed plate drive shaft 14 is fixed to the upper face of the indexing plate 58 by means of suitable machine screws 64 and consequently

this shaft rotates with the plate when the latter is rotated by the planetary gear assembly.

Ordinarily the gear housing **34** will be freely rotated about the reducer shaft **32** by way of the sun gear **52** and the planet gears **54** and **56**. Under these conditions the index plate **58** can be held against rotation such that no output power is delivered to the shaft **14**. If, however, the gear housing **34** is held against rotation and the index plate **58** is free to turn, the reducer output shaft **32** will drive the index plate **58** and consequently the shaft **14** will be driven in rotation.

The index plate **58**, as best shown in FIG. 2, has equally spaced notches **66** formed in its peripheral edge. The edge of the index plate **58** between adjacent notches is on a curvature which provides a cam surface cooperating generally with an index pawl **68**. When the index pawl **68** is engaged with any one of the notches **66**, the pawl serves to hold the plate **58** and consequently the shaft **14** against rotation. The rotational position of the dial feed plates **10** and **12** in respect to the several locating notches **66** of the index plate **58** when either mounted on the upper end of the shaft **14** is so adjusted that whenever the index pawl **68** is seated in a notch **66** of the index plate, a work holding socket **18** of the dial feed plate will be in the work zone of the press to receive the impact of the press ram.

The invention provides mechanism for releasing the index plate **58** from the holding effect of the index pawl **68** and for thereafter holding the gear housing **34** against rotation such that the index plate and the dial feed plate shaft **14** connected thereto are driven. The first of these functions is performed by an index plate release assembly **70**, as best shown in FIGS. 4 and 5, and the second of these functions is performed by a brake device **72**, disclosed in FIGS. 1, 2 and 3.

The index plate release assembly **70** (FIG. 5) consists essentially of the index pawl **68**, a ratchet **74** cooperating therewith and a rotary solenoid **76** for driving the ratchet **74**. The rotary solenoid **76** is fixed to a stationary frame member **78** such that the index pawl **68** is in horizontal alignment with the edge of the index plate **58**. The index pawl **68**, as shown in FIG. 4, has a cross-sectional configuration of an inverted, truncated cone. It is adapted to reciprocate in a correspondingly shaped, fixed guideway **80**. The outer end of the index pawl is supported by a fixed strap **82** which has an apertured downwardly extending leg **84** through which the pawl extends.

The pawl **68** is ordinarily urged inwardly, i.e., its inner end is pressed into contact with the periphery of the index plate **58** by means of a spring **86** interposed between a shoulder on the pawl and the inner face of the leg **86**. Extending downwardly from the bottom face of the index pawl **68** is a lug **88** which is adapted to engage the peripheral edge of the racthet **74** which has formed in its periphery a plurality of equally spaced oblong ratchet teeth **90**. If the ratchet **74** is rotated in a counterclockwise direction when the lug **88** is engaged with the teeth of the ratchet, as viewed in FIG. 5, the index pawl **68** will be projected to the right in that figure against the tension of the spring **86**. When so projected, the inner end **92** of the index pawl will be withdrawn from the index plate notch **66** with which it is engaged such that the index plate **58** is free to rotate.

The index pawl **68** is operated to release the index plate **58** by the rotary solenoid **76** which has a plurality of clutching teeth **94** formed in the free end of its core. These teeth are adapted to engage a corresponding set of teeth **96** formed in one end of a ratchet shaft **98**. The teeth **94** and **96** are normally separated from each other. However, when the solenoid **76** is energized, its core **100** will be projected and rotated simultaneously to first engage the teeth **94** and **96** and then rotate the ratchet shaft **98**. From the foregoing it can be seen that when the rotary solenoid **76** is energized projection and rotation

of its core will rotate the ratchet **74** and will cause the ratchet to project the pawl **68** to the right by reason of engagement between the ratchet and the lug **88** on the index pawl. The index plate **58** is thus released and can now be rotated.

The ratchet shaft **98** is supported for rotation in a porous bronze bearing **102** which is surrounded by a lubricating gland **104** to which a lubricant is admitted from an oil cup **106**. The ratchet **74** is, of course, connected to the upper free end of the ratchet shaft **98**.

In order to hold the gear housing **34** against rotation, there is provided herein a braking mechanism, as stated. By reference to FIGS. 1, 2 and 3, it will be seen that the annular vertical outer face of the gear housing **34** is surrounded by a brake band **108**. This band is supported relative to the gear housing **34** by means of a fixed supporting lug **110** and a fixed rod **112**. The lug **110** extends outwardly from the supporting frame **113** and it is apertured to receive a stud **114** fixed to and extending outwardly from the brake band **108**. A coil spring **116** is disposed between the inner face of the lug **110** and the outer face of the brake band **108** and bears thereon with sufficient force to urge the brake band in the direction of the gear housing **34**.

The mechanism by which the brake band **108** is brought into braking engagement with the gear housing **34**, includes the supporting rod **112** and its associated mechanism. The brake band **108** is in the form of an annular split band having a pair of apertured ears **118** and **120** (FIG. 2) through which the supporting rod **112** passes. The supporting rod **112** also passes through a pair of apertured upstanding mounting lugs **122** and **124** which comprise fixed parts of the frame structure.

The brake band **108** is normally biased into open position by means of a coil spring **126** seated about the supporting rod **112** and located between the brake band ears **118** and **120**. When the spring **126** is effective on the brake band, it will hold the band away from the gear housing **34** a sufficient distance to let the gear housing rotate freely.

The ear **120** of the brake band normally bears against a fixed abutment **128**, while the opposite ear **118** is engaged by an operating lever **130**. The side of the operating lever **130** remote from the brake band ear **118** has an angular camming surface **132** engaging a complementary camming surface **134** formed in one end of a fixed nut **136**. Thus, when the operating lever **130** is actuated by pulling it downwardly, as viewed in FIG. 1, the camming surfaces **132** and **134** will coact with the result that the lever **130** will force the brake band ear **118** toward its complement **120** and thereby tighten the brake band against the outer wall of the gear housing **34**. Under these conditions, the gear housing **34** will be held stationary and rotation, instead, will be imparted to the index plate **58** and the output shaft **14** fixed thereto and extending therefrom.

The brake operating shaft **130** is yieldingly connected to a link **138**. This connection is effected by a coil spring **140** which is disposed between the operating lever **130** and a nut **142** at the upper end of the link **138**. The link **138** is pivoted to a core **144** of a solenoid **146** by means of a pivot pin **148**. Thus, when the solenoid **146** is energized and attracts its core **144**, the link **138** will be drawn downwardly, as viewed in FIG. 1. This will serve to swing the lever **130** about the axis of the supporting rod **112** and thereby contract the brake band **108** against the wall of the gear housing **34**, thereby holding the housing against rotation.

It has been stated hereinabove that the movement of the several parts of the dial feed mechanism must be so synchronized with each other and with the operation of the press ram so as to assure the proper registration of the workpiece in the work zone for receiving the impact of the press ram and for the purpose of avoiding malfunction of the equipment. This synchronous operation is brought

about by a simple control circuit, such as shown in FIG. 9. In this figure, the press crank shaft **150** has a cam **152** fixed thereto. A normally open microswitch **154** is so located and associated with the cam **152** that the microswitch **154** is closed by the cam **152** at the top of the press stroke. The several components of the control circuit are connected across 220-volt power lines **156** and **158**.

The rotary solenoid **76** is fed 90 volts direct current by means of a rectifier **160**. The rotary solenoid **76** will, therefore, be energized at the top of the press stroke when the cam **152** closes the microswitch **154**. When this condition is present, the index pawl **68** will be withdrawn from contact with the index plate **58**, as above explained.

The outer end of the index pawl **68** (FIG. 2) has associated therewith a pair of microswitches **162** and **164** which are transferred when the index pawl **68** is reciprocated (see also FIG. 9). The microswitch **162** is normally open and the microswitch **164** is normally closed. In the context of this description, the term "normally" is taken to mean the position of the elements when the index pawl **68** is fully engaged with the index plate **58**.

It can be seen that the planetary brake actuating solenoid **146** (FIG. 9) should be deenergized by opening of the microswitch **162** when the index plate **58** is held against rotation. By the same token, it can be seen that the solenoid operated valve **166** should block passage of air to a press control cylinder **170** when the index plate **58** is free to revolve. As seen in FIG. 9, closure of the microswitch **162** as the index pawl **68** (FIG. 2) moves to the right to disengage the index plate **58** will close the microswitch **162** and will thus energize the brake operating solenoid **146**. When the brake operating solenoid **146** is energized, it will hold the planetary gear housing **34** against rotation and cause rotation of the indexing plate **58** and its associated output shaft **14**.

When the index plate **58** moves a distance of one station, i.e., the distance between the center of adjacent workpiece sockets (FIGS. 7 and 8), the end **92** of the index pawl **68** will drop into the next indexing notch **66**. As this action takes place, the index pawl **68**, upon inward movement into engagement with the index plate **58**, will permit the microswitch **162** to open. Since the opening of the microswitch **162** now breaks the circuit to the planetary brake solenoid **146**, the brake solenoid **146** will release the planetary breaking mechanism with the result that the output torque of the planetary gear system via the index plate **58** and the output shaft **14** is reduced to zero.

When the index pawl **68** moves out of contact with the index plate **58**, i.e., to the right in FIG. 2, the microswitch **164**, normally closed, will open thereby opening the circuit to the solenoid valve **166**. This will prevent operation of the press control air cylinder **170**. Thus, a safeguard is provided against inadvertent operation of the press while the index plate **58** is free to rotate. However, with the index pawl **68** in its full "in" position in contact with the index plate **58**, the microswitch **164** will close to operate the solenoid operated valve **166** to allow a supply of compressed air to flow by way of a foot-operated valve **168** to the press control air cylinder **170** which is of conventional structure and which is connected in a conventional fashion to the press clutch. This portion of the circuit, therefore, provides an interlock to prevent tripping of the press when the feed dial is not properly registered in the work zone.

From the foregoing, it can be seen that a very simple, yet effective and safe, feed device has been provided for the successive feeding of workpieces of irregular shape and form to the work zone of sizing and coining presses. The invention has been described in conjunction with a single physical embodiment of which the component parts have equivalent counterparts readily interchangeable with the illustrative components adopted for the explanation of the invention. It is contemplated, therefore, that the claims will circumscribe the scope of the invention and that the specific illustration and description have as their purpose the disclosure of a practical embodiment.

What is claimed is:

1. A press feeding mechanism comprising a feed disk having a plurality of workpiece sockets spaced about its periphery, means for intermittently rotating said feed disk to bring said sockets successively into registration with a work zone, means for positively latching said disk against rotation when said sockets are rotated into said work zone, electromagnetic means for releasing said latching means between press strokes, a normally open energizing circuit for said electromagnetic means, and press controlled means for periodically closing said energizing circuit.

2. A press feeding mechanism comprising a feed disk having a plurality of workpiece sockets spaced about its periphery, indexing means for intermittently rotating said feed disk to bring said sockets successively into registration with a work zone, means for positively latching said disk against rotation when said sockets are rotated into said work zone, press controlled means for releasing said latching means between press strokes, and means under control of said latching means when the same is in release position for indexing said feed disk.

3. A press feeding mechanism comprising a feed disk having a plurality of workpiece sockets spaced about its periphery, indexing means for intermittently rotating said feed disk to bring said sockets successively into registration with a work zone, means for positively latching said disk against rotation when said sockets are rotated into said work zone, press controlled means for releasing said latching means between press strokes, and electromagnetic means under control of said latching means when the same is in release position for indexing said feed disk.

4. A press feeding mechanism comprising a feed disk having a plurality of workpiece sockets spaced about its periphery, indexing means for intermittently rotating said feed disk to bring said sockets successively into registration with a work zone, means for positively latching said disk against rotation when said sockets are rotated into said work zone, electromagnetic means for releasing said latching means between press strokes, electromagnetic means under control of said latching means when the same is in release position for indexing said feed disk, a normally open energizing circuit for said first named electromagnetic means, and press controlled means for periodically closing said energizing circuit.

5. A press feeding mechanism comprising a feed disk having a plurality of workpiece sockets spaced about its periphery, means for intermittently rotating said feed disk to bring said sockets successively into registration with a work zone, means for positively latching said disk against rotation when said sockets are rotated into said work zone, press controlled means for releasing said latching means between press strokes, press control means, and means effective to disable said press control means whenever said feed disk is released for rotation by said latching means.

6. A press feeding mechanism comprising a feed disk having a plurality of workpiece sockets spaced about its periphery, means for intermittently rotating said feed disk to bring said sockets successively into registration with a work zone, means for positively latching said disk against rotation when said sockets are rotated into said work zone, electromagnetic means for releasing said latching means between press strokes, press control means, means effective to disable said press control means whenever said feed disk is released for rotation by said latching means, a normally open energizing circuit for said electromagnetic means, and press controlled means for periodically closing said energizing circuit.

7. A press feeding mechanism comprising a feed disk having a plurality of workpiece sockets spaced about its periphery, indexing means for intermittently rotating said feed disk to bring said sockets successively into registration with a work zone, means for positively latching said disk against rotation when said sockets are rotated into said work zone, press controlled means for releasing said latching means between press strokes, press control means, means effective to disable said press control means whenever said feed disk is released for rotation by said latching means, and means under control of said latching means when the same is in release position for indexing said feed disk.

8. A press feeding mechanism comprising a feed disk having a plurality of workpiece sockets spaced about its periphery, indexing means for intermittently rotating said feed disk to bring said sockets successively into registration with a work zone, means for positively latching said disk against rotation when said sockets are rotated into said work zone, press controlled means for releasing said latching means between press strokes, press control means, means effective to disable said press control means whenever said feed disk is released for rotation by said latching means, and electromagnetic means under control of said latching means when the same is in release position for indexing said feed disk.

9. A press feeding mechanism comprising a feed disk having a plurality of workpiece sockets spaced about its periphery, indexing means for intermittently rotating said feed disk to bring said sockets successively into registration with a work zone, means for positively latching said disk against rotation when said sockets are rotated into said work zone, electromagnetic means for releasing said latching means between press strokes, press control means, means effective to disable said press control means whenever said feed disk is released for rotation by said latching means, electromagnetic means under control of said latching means when the same is in release position for indexing said feed disk, a normally open energizing circuit for said first named electromagnetic means, and press controlled means for periodically closing said energizing circuit.

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