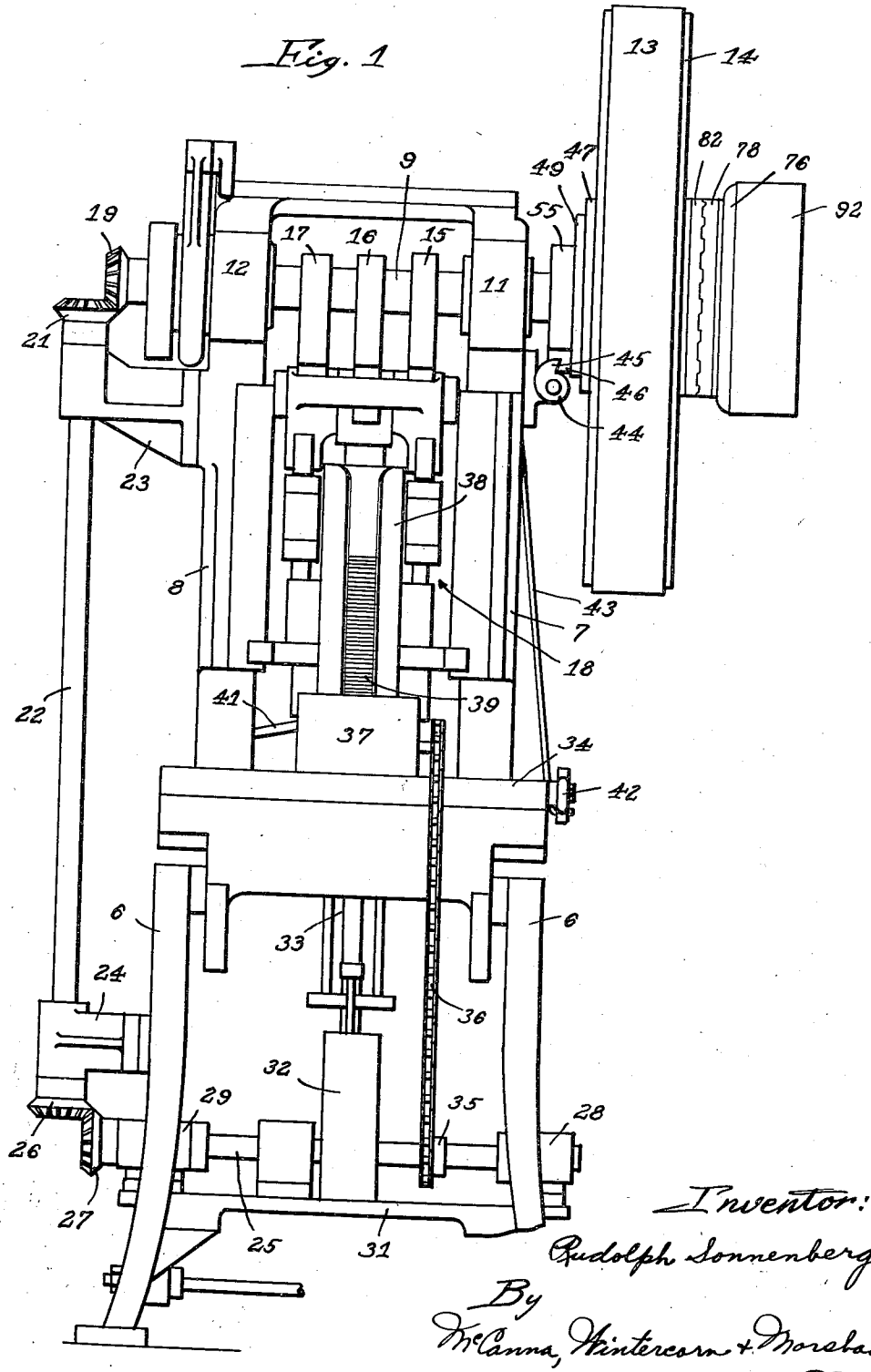
Jan. 23, 1940. R. SONNENBERG 2,187,955

PRESS AND CLUTCH THEREFOR

Filed Jan. 26, 1938 3 Sheets-Sheet 1

Fig. 1



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Jan. 23, 1940. R. SONNENBERG 2,187,955

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Filed Jan. 26, 1938 3 Sheets-Sheet 2

Fig. 2

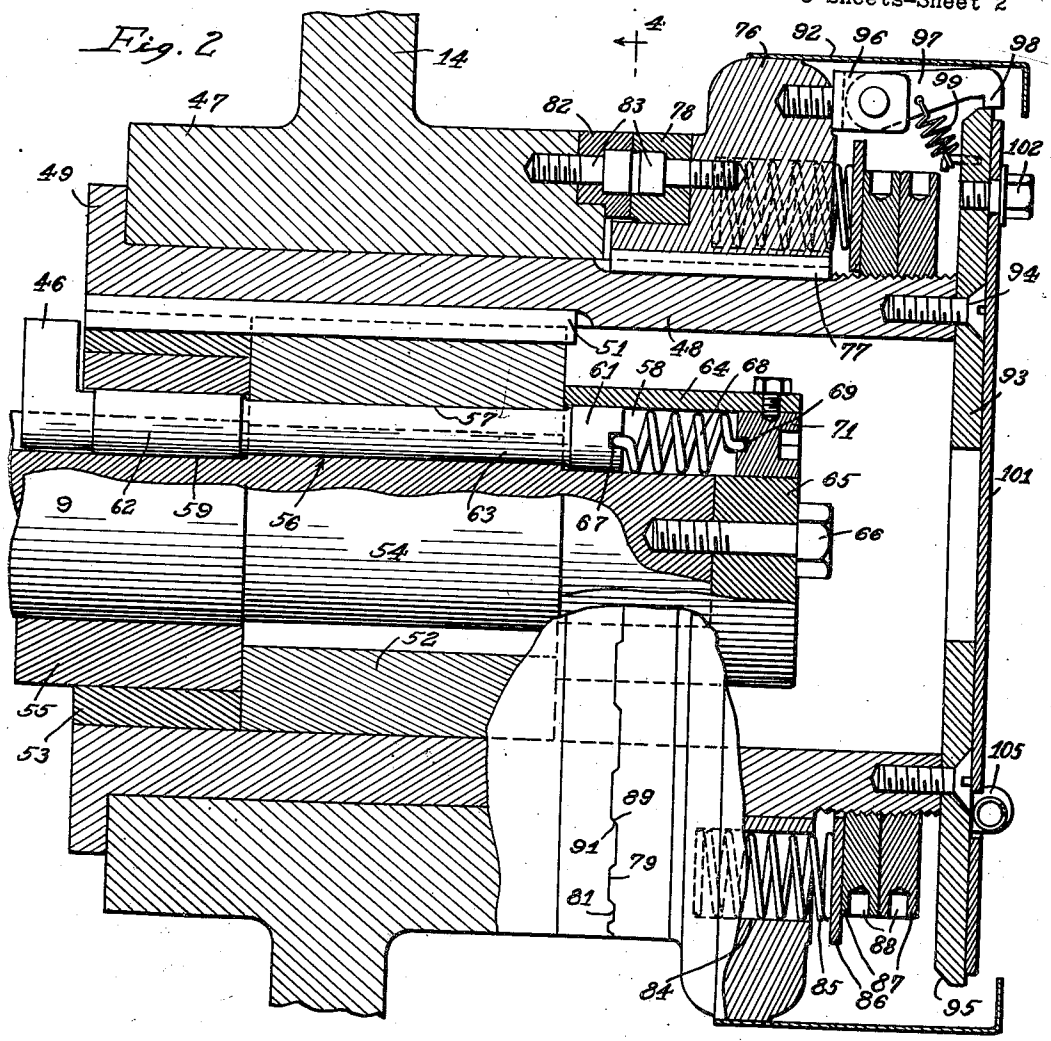
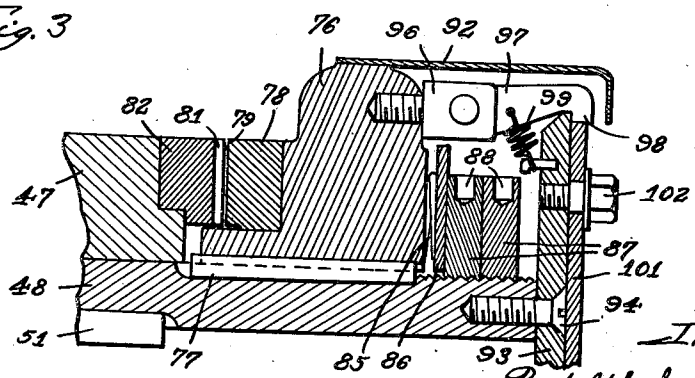


Fig. 3



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Jan. 23, 1940. R. SONNENBERG 2,187,955

PRESS AND CLUTCH THEREFOR

Filed Jan. 26, 1938 3 Sheets-Sheet 3

Fig. 4

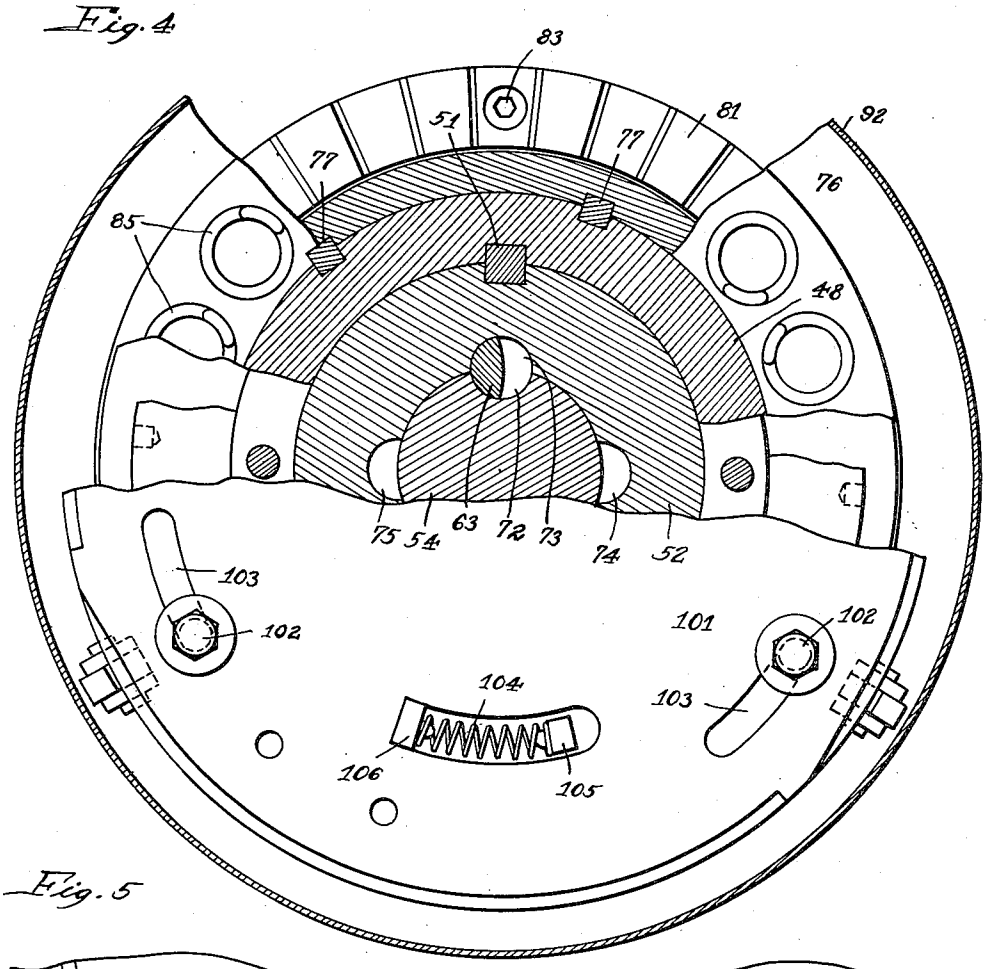
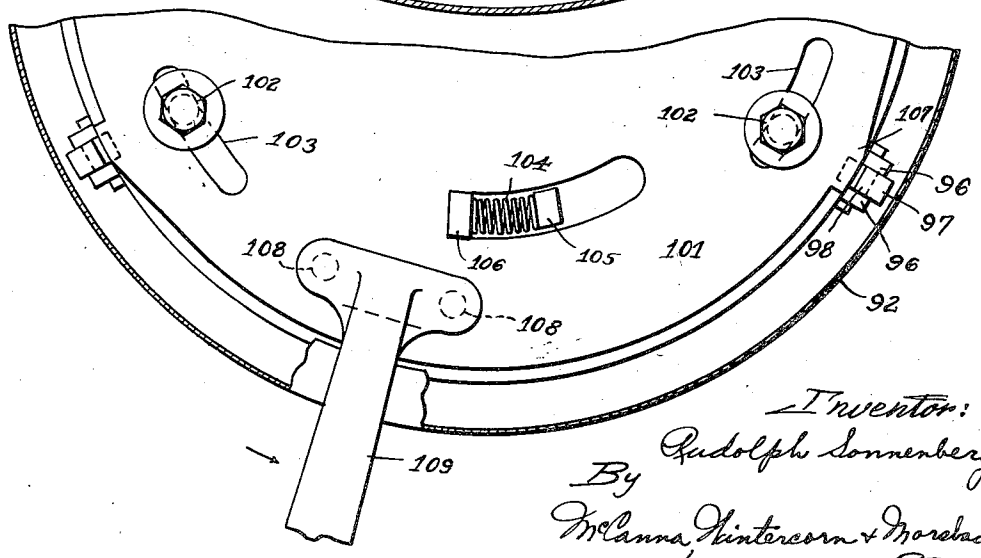


Fig. 5



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Patented Jan. 23, 1940 2,187,955

UNITED STATES PATENT OFFICE

2,187,955

PRESS AND CLUTCH THEREFOR

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Application January 26, 1938, Serial No. 186,999

16 Claims. (Cl. 192—48)

This invention relates to punch presses of the type used in the forming of paper bottle caps and the like and to the combination therein of improved overload mechanism.

In the operation of presses of the character used in the forming of paper articles such as bottle caps and the like using high pressure and heavy paper stock and in analogous uses of such presses, considerable difficulty is encountered because of failure or improper operation of the mechanism for removing the formed piece from the dies. This is particularly aggravated when the object is of complicated configuration requiring compound dies which tend to produce difficulty in removing the object. Furthermore, when the object is formed from paper stock there is not only the tendency for the object to stick in the dies, but care must be taken in the removal of the object in order to prevent damage thereto. In the making of bottle caps, for example, a formed cap will occasionally stick in the die, and when automatic feeding mechanism is employed, a second blank will be fed into the dies. Because of the high pressures and the small tolerances, the machine is thus damaged in some part when the dies come together. Sometimes the shaft is bent, other times the dies are damaged, and occasionally the frame of the machine is broken. These accidents are obviously costly and greatly interfere with smooth and uniform production. In order to avoid the accidents to as great an extent as possible, the presses are run at low speeds in order to render the feeding and the ejecting mechanism as positive in operation as possible, and also to permit of stopping the machine before the damage has gone too far. Thus the machines are conventionally operated at far below their full capacity because of the extreme damage done by the occasional failure of the feeding or ejecting mechanism.

An important object of the invention is the provision of a high speed forming press wherein the transmission of power to the dies is instantly terminated when the normal forming pressure between the dies is greatly exceeded for the purpose of preventing damage to the dies or other parts of the machine.

Another object of the invention is the provision of a high speed forming press for paper bottle caps wherein the paper blanks are automatically fed into the dies and are automatically removed therefrom, and wherein means are provided for interrupting the power supply to the dies in case a second blank is fed into the dies prior to the ejection of the preceding cap or in case two or more blanks are simultaneously fed into the dies, and the power supply remains disconnected until manually reconnected.

I have also aimed to provide a high speed forming press driven through a flywheel wherein an overload release clutch is interposed between the flywheel and the primary driving shaft of the press for the purpose of disconnecting the power supply to the dies of the press in case the pressure between the dies becomes excessive.

Another object of the invention is the provision of an overload release clutch of novel structure and characteristics.

A still further object of the invention is the provision of a clutch mechanism including a manually engageable and disengageable clutch member driven from an overload release clutch adapted to automatically disengage in response to excessive driving force, and adapted to remain in the released position until manually actuated for re-engagement.

Other objects and advantages will appear from the following description and the accompanying drawings, in which—

Fig. 1 is an elevation of a high speed bottle cap forming press embodying my invention;

Fig. 2 is a longitudinal section through the hub of the flywheel, the end of the primary driving shaft and the clutch mechanism showing the clutch in the engaged position;

Fig. 3 is a fragmentary view similar to Fig. 2 showing the overload clutch in the disengaged position;

Fig. 4 is a view along the line 4—4 of Fig. 2 showing fragmentary spaced sections transversely through the clutch mechanism, and

Fig. 5 is a fragmentary face view of the cam plate and clutch latches, the cover being in section, showing the plate moved to the releasing position.

The invention contemplates a press having a conventional frame structure including legs designated generally by the numeral 6 and spaced uprights 7 and 8. A primary drive shaft 9 is positioned in bearings 11 and 12 adjacent the upper end of the uprights 7 and 8. The shaft 9 is driven by means of a belt 13 trained over a flywheel pulley 14 as is common in the art. Carried on the shaft 9 between the uprights 7 and 8 are cams 15, 16 and 17 arranged to actuate a reciprocating compound die designated generally by the numeral 18. In this instance the die 18 is shaped and arranged to cooperate with a lower die in the forming of a paper milk bottle cap. On one end of the shaft 9 is a quarter-turn gear 19 adapted

to mesh with a second quarter-turn gear 21 carried on a shaft 22 journaled at its upper end on the upright 8 by means of a bracket 23 and at its lower end on the legs 6 by means of a bracket 24. A lower horizontal shaft 25 is driven from the shaft 22 by means of quarter-turn gears 26 and 27, the shaft 25 being journaled in bearings 28 and 29 carried on the lower shelf 31. The shaft 25 carries cam means within a housing 32 adapted to reciprocate through vertical members 33, the lower section of a compound die located in proximity to the plane of the table 34 and cooperable with the upper portion 18 of the die. The shaft 25 carries a sprocket 35 over which is trained a chain 36 adapted to drive a blank or disk feeding mechanism 37, the latter having a vertical tube 38 adapted to hold a supply of paper disks 39 to be fed into position between the upper and lower portions of the die. The specific form of the disk feeding mechanism forms no part of the invention but is so arranged as to feed a single disk between the die sections on each reciprocation of the primary drive shaft 9, or in other words, upon each die operation. An air supply pipe 41 terminates in a jet adjacent the die, the air supply being controlled in response to rotation of the shaft 22 so as to blow the formed cap out of the die as the die sections separate, and in this manner eject the cap from the dies. A hand-actuated lever 42 is secured to the frame and has a rod 43 for rotating a pivotally supported catch 44 having a finger 45 adapted to engage an arm portion 46 of a manually operated clutch presently to be described, for engaging and disengaging the drive connection between the flywheel 14 and the primary drive shaft 9.

Referring now more particularly to the clutch mechanism shown to best advantage in Fig. 2, the numeral 47 designates the hub of the flywheel 14. Positioned within the hub 47 and having a running fit with respect thereto is a sleeve 48 having an end flange 49 adapted to abut against the edge of the hub. Positioned within the sleeve 48 and keyed thereto by means of a key 51 are bearing sleeves 52 and 53 within which the end of the shaft 9 is received with a running fit. In this instance the end 54 of the shaft 9 is of slightly smaller diameter than the main body of the shaft, and the sleeve 52 is of slightly lesser internal diameter to bear against the portion 54. A sleeve 55 is positioned on the shaft 9 and fills the space between the shaft and the sleeve 53, rotating with the shaft. Means are provided for clutching and declutching the shaft 9 with respect to the sleeve 52. This includes a pin designated generally by the numeral 56 seated in a bore 57 and counterbores 58 and 59 of the shaft 9. The pin has enlarged cylindrical bearing portions 61 and 62 seated in the spaced counterbores 58 and 59 and an intermediate portion 63 approaching half-roundness in cross-sectional shape, as shown in Fig. 4. As will be noted from Fig. 4, the bore 57 and counterbores 58 and 59 are positioned on the dividing line between the shaft portion 54 and the sleeve 52. The bearing portion 62 is retained in position by the sleeve 53 while the bearing portion 61 is retained in position by the tubular side walls 64 of a cap 65 secured in position over the end of the shaft 9 by a cap screw 66. The end of the pin 66 has a transverse slot 67 adapted to receive one end of a spring 68, the opposite end of which is received in a transverse slot 69 of a plug 71 in the end of the bore 58. It will be seen from Fig. 4 that one portion of the bore 57 as shown at 72 is in the shaft 54 while the other portion thereof indicated at 73 is positioned in the sleeve 52. The central portion 63 of the pin is so shaped that when rotated to the position shown in Fig. 4 a part of the pin rests in the bore portion 72 and another portion of the pin in the bore portion 73 thereby establishing driving connection between the sleeve and the shaft. However, upon rotation of the arm portion 46 the pin is rotated until the portion 63 thereof lies entirely within the portion 72 of the bore and so that the free side of the portion 63 is flush with the outer surface of the shaft portion 54, thereby permitting relative rotation between the sleeve 52 and the shaft portion 54. The bore portion 73 is duplicated at spaced intervals around the inner surface of the sleeve 52 as shown at 74 and 75. The spring 68 serves to normally hold the pin in the engaged position as shown in Fig. 4, but upon rotation of the lever 42 of the press the finger 45 of the catch 44 engages against the clutch arm 46 causing rotation of the pin 56 to the disengaged position. Thus, through the instrumentalities just described, the shaft 9 is manually clutched and declutched to the sleeve 48.

A second clutch is provided between the sleeve 48 and the hub 47 of the flywheel, which clutch is adapted to be automatically disengaged in response to overload in the press and is adapted to either automatically re-engage in response to decrease in the overload or to remain in the disengaged position until manually released. This clutch includes a manually movable clutch member 76 keyed to the sleeve 48 by means of keys 77 and adapted for sliding movement longitudinally of the sleeve. This movable clutch member is in the form of a ring extending annularly of the sleeve 48. Positioned on the clutch member 76 is an annular hardened ring 78 having annularly spaced teeth or cams 79 thereon adapted to interfit and engage with similar teeth 81 on a hardened ring 82 secured to the hub 47 of the flywheel. Cap screws 83 serve to secure the clutch rings to their respective supports. Spaced annularly of the movable clutch member 76 are bores 84, each adapted to receive a spring 85 of sufficient length to bear against the bottom of the bore and project from the open end thereof. Positioned to bear against the ends of the springs 85 is an annular disk 86 urged against the springs to tension the same by means of nuts 87 threaded onto the end of the sleeve 48, the two nuts acting as lock nuts and having openings 88 adapted for the reception of a spanner wrench, pin or the like for adjusting the position of the nuts. The position of these nuts determines the pressure with which the rings 78 and 82 will be urged together, and consequently the force required to separate the rings by cam action between opposed edges 89 and 91 of the ring teeth 79 and 81. In this particular instance the edges 89 and 91 are at an angle of 45° with respect to the ends, but this may be varied depending upon the power to be transmitted. A cover 92 is attached to the clutch member 76 and extends annularly thereof to a point beyond the end of the sleeve 48 to enclose the described clutch mechanism.

In many instances the clutch mechanism is complete at this point, in which case the clutch will automatically disengage and engage in response to the appearance and the disappearance of overload or excessive pressure between the die elements. In the case of overload, the teeth 79 of the ring 78 will be forced out of interfitting relationship with the teeth 81 causing the fly-

wheel 14 to rotate with respect to the sleeve 48. The springs 85 will tend to cause the teeth 79 to move into the next engaging position with respect to the teeth 81, but the fact that the sleeve 48 is stopped and the flywheel is traveling at a relatively high rate of speed will prevent such engagement. The clutch does, however, create under these circumstances a considerable amount of noise. Under some circumstances the production of the sound is desirable in that it produces an audible warning of press difficulties such as to command immediate attention. I have arranged, however, to provide means for maintaining the clutch element 76 in the disengaged position when automatically moved thereto as heretofore described. This consists of an end plate 93 secured by means of countersunk screws 94 to the end of the sleeve 48, the end plate being concentric with respect to the sleeve and having a beveled inner edge 95. At annularly spaced points on the clutch member 76 are spaced ears 96 pivotally supporting latch members 97 each having an end 98 adapted, upon sliding movement of the clutch member 76 to the disengaged position as shown in Fig. 3, to drop over the edge of the end plate 95 to prevent return movement of the clutch member 76 out of the disengaged position. Springs 99 urge the latch members 97 into the latched position.

In order to disengage the latches I have provided a cam plate 101 positioned against the outer face of the end plate 93 concentrically with respect thereto by means of screws 102 which pass through slots 103 in the cam plate to permit of rotation of the cam plate about the center thereof. A spring 104 acts between a lug 105 on the end plate 93 and a lug 106 on the cam plate normally urging the cam plate in a clockwise direction facing Fig. 4. The periphery of the cam plate 101 is provided with cams 107 opposite each of the latch members 97, the cams engaging the ends 99 of the latch members when rotated in a counter-clockwise direction against the tension of the spring 104, as shown in Fig. 5, in order to force the latch members outward out of engagement with the end plate 93. The cam plate is provided with spaced openings 108 on its outer surface adapted for engagement by a spanner wrench 109 for manual rotation of the cam plate as shown in Fig. 5 to release the clutch.

It will be seen that I have provided a press having novel characteristics and suitable for use in the formation of paper articles wherein failure or faulty operation of the feeding or ejecting mechanism does not damage the press or the dies, and wherein the press is automatically interrupted until such time as the condition between the dies is corrected; in other words, until the dies are backed up and the excess material is removed from between the die parts. This protects the press from the damage which has been common in the past and permits of much higher speed operation. In the forming of bottle caps I have found that the speed of operation of the presses may be increased as much as 300% and more by constructing the presses in the manner herein described, and that upon failure of the ejecting mechanism, no damage occurs to the press. In so doing, I have provided an overload clutch in addition to the standard clutch mechanisms commonly employed in machines of this character.

I have also provided an improved form of overload clutch which is very sensitive in operation and which may be arranged either to remain disengaged or to automatically return to engagement upon removal of the overload, and when operated in the latter fashion, serves to emit an audible and commanding signal as to its condition.

While I have thus described and illustrated a specific embodiment of the invention I am aware that numerous alterations and changes may be made therein without departing from the spirit of the invention, and I do not wish to be limited except as required by the prior art and the scope of the appended claims, in which I claim:

1. The combination in a press of a die, a shaft for reciprocating said die, a flywheel for driving said shaft, and two clutches between the shaft and the flywheel, one of said clutches being manually operable between engaged and disengaged positions, and the other of said clutches being an overload clutch movable to the disengaged position in response to a predetermined excess in pressure on said die to release said flywheel from driving connection with said shaft.

2. The combination in a press of a die, a shaft for reciprocating said die, a flywheel for driving said shaft, two clutches between the shaft and the flywheel, one of said clutches being manually operable between engaged and disengaged positions, and the other of said clutches being an overload clutch movable to the disengaged position in response to a predetermined excess in pressure on said die to release said flywheel from driving connection with said shaft, means for latching said last mentioned clutch in the disengaged position, and manually operable means for releasing said clutch means.

3. The combination in an overload clutch of a driving and a driven member, a clutch element fixedly carried on one of said members, a movable clutch element carried on the other of said members for movement toward and away from the first mentioned clutch element, said clutch elements having interfitting cam means to normally establish driving connection therebetween shaped to move said movable clutch element through cam action to a disengaged position at a predetermined point of power transmission therebetween, spring means for urging said cam means into interfitting relation, and means operative in response to said disengaging movement of the clutch element for latching the movable clutch member in said disengaged position.

4. The combination in an overload clutch of a driving and a driven member, a clutch element fixedly carried on one of said members, a movable clutch element carried on the other of said members for movement toward and away from the first mentioned clutch element, said clutch elements having interfitting cam means to normally establish driving connection therebetween shaped to move said movable clutch element through cam action to a disengaged position at a predetermined point of power transmission therebetween, spring means for urging said cam means into interfitting relation, means for latching the movable clutch member in said disengaged position in response to said cam movement of said clutch element, and means for manually releasing said latch means.

5. The combination in an overload clutch of a driving and a driven member positioned to rotate on the same axis, a clutch element for transmitting power between said members supported annularly of and slidable longitudinally of one of said members, clutch rings on said element and the other of said elements of equal radius and con-

centric with the axis of rotation, said rings having interfitting cam means for transmitting rotation therebetween and shaped to move said element and attached ring through cam action to a disengaged position at a predetermined point of power transmission therebetween, spring means acting longitudinally of said shaft between said element and its supporting member for urging said cam means together, and means on said last mentioned member for adjusting the compression on said spring means.

6. The combination in an overload clutch of a driving and a driven member positioned to rotate on the same axis, a clutch element for transmitting power between said members supported annularly of and slidable longitudinally of one of said members, clutch rings on said element and the other of said elements of equal radius and concentric with the axis of rotation, said rings having interfitting cam means for transmitting rotation therebetween and shaped to move said element and attached ring through cam action to a disengaged position at a predetermined point of power transmission therebetween, spring means acting between said element and its supporting member for urging said cam means together, means on said last mentioned member for adjusting the compression on said spring means, and latch means acting between the element and its supporting member in response to movement of the element for securing the element in disengaged position.

7. The combination in an overload clutch of a driving and a driven member positioned to rotate on the same axis, a clutch element for transmitting power between said members supported annularly of and slidable longitudinally of one of said members, clutch rings on said element and the other of said members of equal radius and concentric with the axis of rotation, said rings having interfitting cam means for transmitting rotation therebetween and shaped to move said element and attached ring through cam action to a disengaged position at a predetermined point of power transmission therebetween, spring means acting between said element and its supporting member for urging said cam means together, means on said last mentioned member for adjusting the compression on said spring means, latch means acting between the element and its supporting member in response to movement of the element for securing the element in disengaged position, and manually operable means on said last mentioned member for releasing said latch means.

8. The combination in an overload clutch of concentric driving and driven members, the inner one of said members projecting beyond the other, a clutch element for transmitting power between said members keyed to the inner member and movable longitudinally thereon between engaged and disengaged positions, interfitting cam means positioned annularly of said element and the outer member for transmitting rotation therebetween and shaped to move said element through cam action to the disengaged position at a predetermined degree of power transmission therebetween, a plurality of coiled springs spaced annularly of said element and acting longitudinally of the inner member to urge said element longitudinally on said inner member for engagement of said cam means, and means operable for compressing said springs to any selected degree to urge the element into the engaged position and thereby preselect the point of disengagement thereof.

9. The combination in an overload clutch of concentric driving and driven members, the inner one of said members projecting beyond the other, a clutch element for transmitting power between said members keyed to the inner member and movable longitudinally thereon between engaged and disengaged positions, interfitting cam means positioned annularly of said element and the outer member for transmitting rotation therebetween and shaped to move said element through cam action to the disengaged position at a predetermined degree of power transmission therebetween, a plurality of coiled springs spaced annularly of said element, means for compressing said springs to urge the element into the engaged position comprising nuts threaded onto said inner member.

10. The combination in an overload clutch of a driving and a driven member, a clutch element fixedly carried on one of said members, a movable clutch element carried on the other of said members for movement toward and away from the first mentioned clutch element, said clutch elements having interfitting cam means to normally establish driving connection therebetween shaped to move said movable clutch element through cam action to a disengaged position at a predetermined point of power transmission therebetween, spring means for urging said cam means into interfitting relation, means for adjusting the tension of said spring means comprising nuts threaded onto said inner member, and means for releasably latching said element in the disengaged position comprising a plate secured to said inner member, spring pressed latches acting between said element and said plate, and manually operable means for releasing said latches.

11. The combination in a clutch mechanism of a driven shaft, a sleeve carried on said shaft for free rotation with respect thereto, manually operated clutch means disposed between the shaft and said sleeve to establish driving connection therebetween, a driving member positioned on said sleeve for free rotation with respect thereto, and an overload clutch operative between said sleeve and said driving member to disengage said sleeve therefrom in response to the transmission of a predetermined driving pressure.

12. The combination in a clutch mechanism of a driven shaft, a sleeve carried on said shaft for free rotation with respect thereto, manually operated clutch means disposed between the shaft and said sleeve to establish driving connection therebetween, a pulley having a hub carried on said sleeve for free rotation with respect thereto, cam means fixed to one edge of said hub, cam means slidable longitudinally on said sleeve to engage and disengage the cam means on said hub to establish driving connection between the pulley and the sleeve, said cam means being shaped to move out of engagement under predetermined pressure, and spring means for urging said last mentioned cam means into engagement.

13. The combination in a clutch mechanism of a driven shaft, a sleeve carried on said shaft for free rotation with respect thereto, manually operated clutch means disposed between the shaft and said sleeve to establish driving connection therebetween, a pulley having a hub carried on said sleeve for free rotation with respect thereto, cam means fixed to one edge of

said hub, cam means slidable longitudinally on said sleeve to engage and disengage the cam means on said hub to establish driving connection between the pulley and the sleeve, said cam means being shaped to move out of engagement under predetermined pressure, spring means for urging said last mentioned cam means into engagement, and means operative in response to said cam movement to latch the last mentioned cam means out of engagement.

14. The combination in a clutch mechanism of a driven shaft, a sleeve carried on said shaft for free rotation with respect thereto, manually operated clutch means disposed between the shaft and said sleeve to establish driving connection therebetween, a pulley having a hub carried on said sleeve for free rotation with respect thereto, cam means fixed to one edge of said hub, cam means slidable longitudinally on said sleeve to engage and disengage the cam means on said hub to establish driving connection between the pulley and the sleeve, said cam means being shaped to move out of engagement under predetermined pressure, spring means for urging said last mentioned cam means into engagement, means operative in response to said cam movement to latch the last mentioned cam means out of engagement, and manually operative means for releasing said latch means.

15. The combination in a clutch mechanism of concentric driving and driven members, the inner one of said members projecting beyond the other, a clutch element positioned annularly upon the projecting end of said inner member for free longitudinal movement but keyed thereto to prevent relative rotational movement thereon, interfitting cam means on the outer of said members and on said clutch element for transmitting rotation therebetween and shaped to move said element through cam action to a disengaged position at a predetermined degree of power transmission therebetween, spring means for urging said cam means into engagement, spring pressed latch means spaced annularly on said clutch element, means on the end of said inner member for engagement by said latch members when said element is moved to the disengaged position, to latch said element in said position, and means on said inner member manually operable for releasing said latch means.

16. The combination in a clutch mechanism of concentric driving and driven members, the inner one of said members projecting beyond the other, a clutch element positioned annularly upon the projecting end of said inner member for free longitudinal movement but keyed thereto to prevent relative rotational movement thereon, interfitting cam means on the outer of said members and on said clutch element for transmitting rotation therebetween and shaped to move said element through cam action to a disengaged position at a predetermined degree of power transmission therebetween, spring means for urging said cam means into engagement, spring pressed latch means spaced annularly on said clutch element, a plate positioned on the end of said inner member having an edge for engagement of said latch means when said element occupies its engaged position for maintaining the latches in unlatched position and for engagement by said latch means when said element is moved to its disengaged position, and cam means positioned on said plate manually operable to simultaneously release all of said latch means.

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