

Nov. 28, 1944.

A. A. SAUL

2,363,556

MATERIAL HANDLING APPARATUS

Filed May 20, 1941

3 Sheets-Sheet 1

Fig. 1.

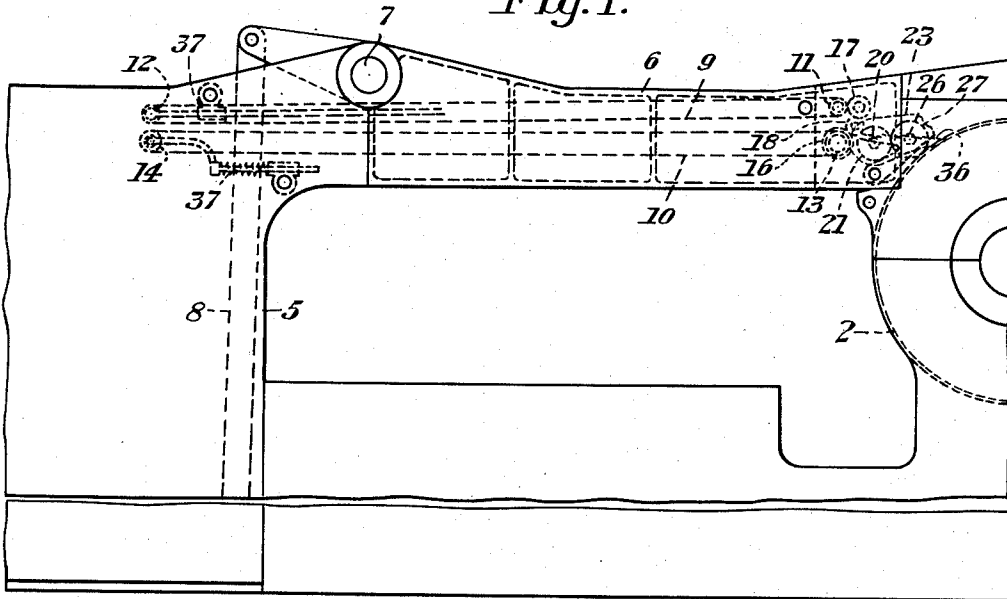
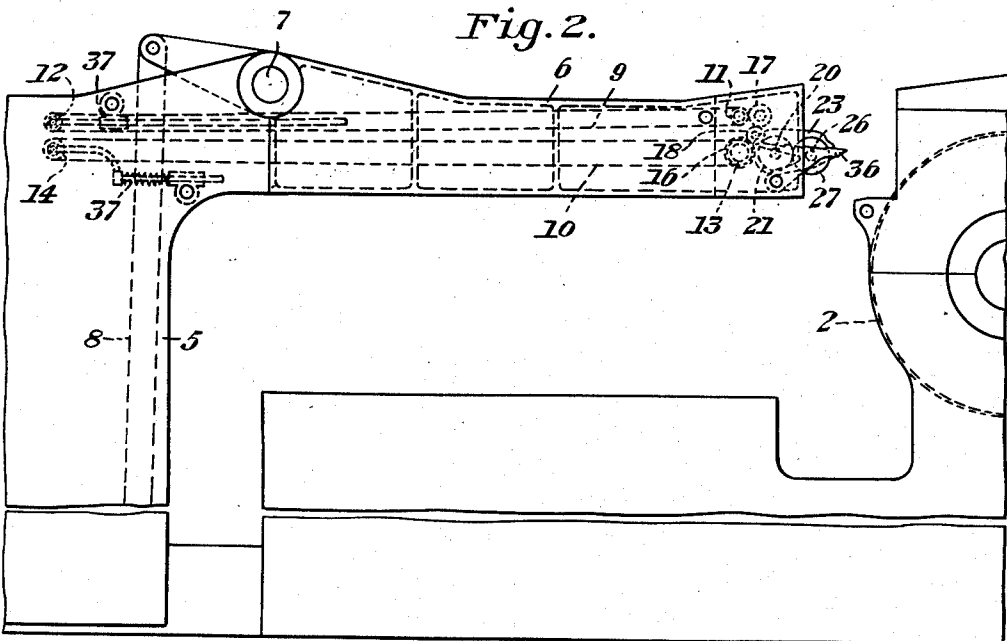


Fig. 2.



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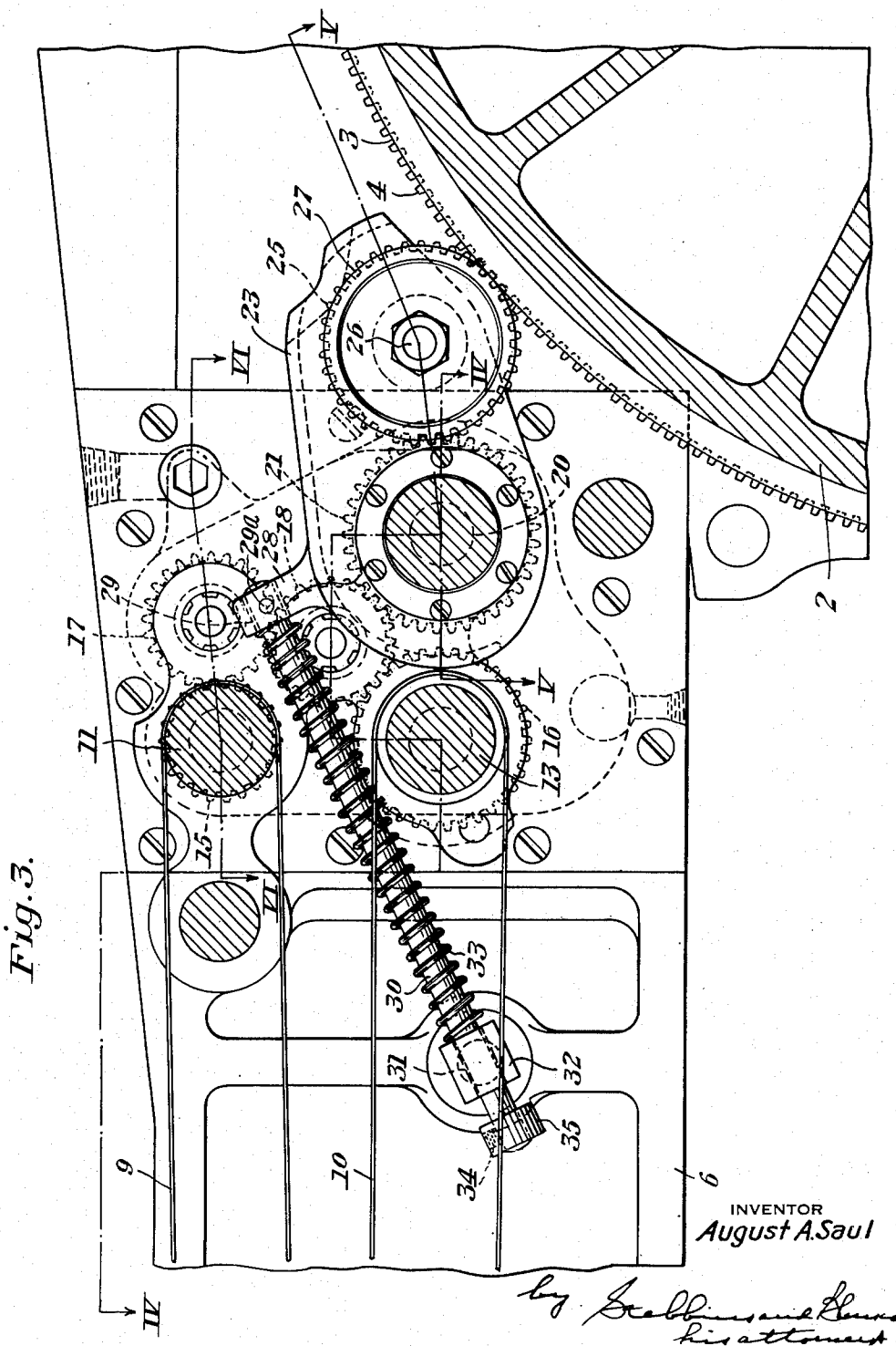
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

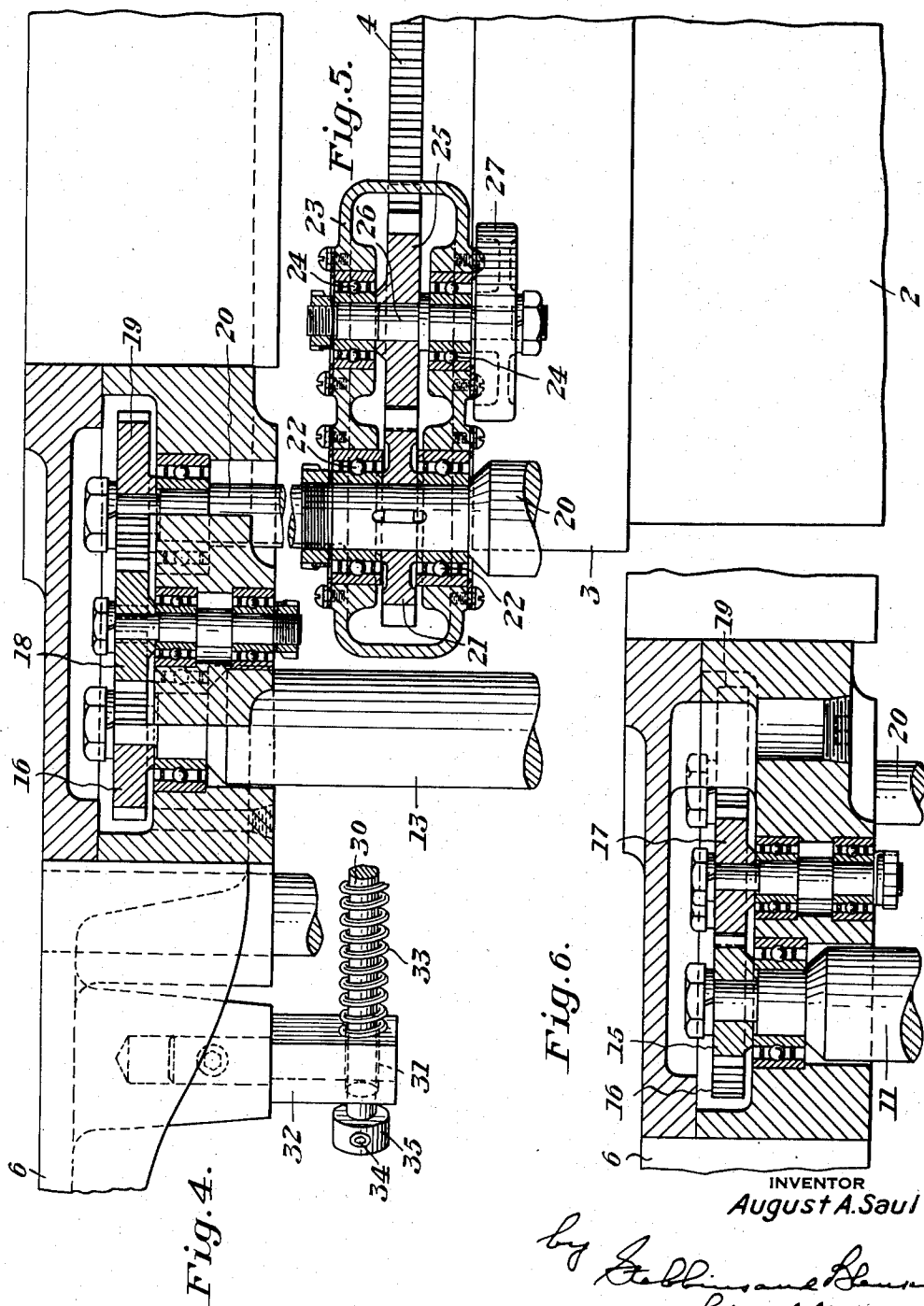


Fig. 4.

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE

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MATERIAL HANDLING APPARATUS

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Application May 20, 1941, Serial No. 394,319

23 Claims. (Cl. 101—279)

This invention relates to material handling apparatus. It relates more particularly to driving means for material handling apparatus having relatively bodily movable or shiftable parts. The invention further relates to a resilient driving connection between portions of material handling apparatus which are relatively bodily movable and through which the apparatus is driven.

While in its broader aspects the invention is applicable to material handling apparatus generally it has particular utility in connection with sheet handling apparatus and especially sheet handling apparatus employed in connection with a printing press or the like where parts to be driven from a common source of power are relatively bodily movable or shiftable. Purely for purposes of explanation and illustration the invention will be described as embodied in printing apparatus having a printing couple and sheet handling apparatus cooperable therewith but separatable therefrom.

Printing apparatus is well known which embodies a printing couple and sheet handling apparatus cooperable with the printing couple during operation of the printing apparatus but separatable therefrom when the apparatus is not in operation to permit access to the printing couple. One such apparatus employs a flat bed and cylinder press and a sheet delivery bodily movable in a straight line toward and from the press. The delivery may be power operated in its movements toward and from the press. The source of power may, for example, be an electric motor and means may be provided for opening the motor circuit when the delivery has moved a predetermined distance away from the press and when it has moved to a predetermined position adjacent the press. Moreover, the press cylinder oscillates generally vertically during operation of the press, being moved down upon the bed on a printing stroke and being raised upon the reverse stroke of the bed. These conditions have presented a problem in the driving of the delivery conveyor. An ordinary gear connection would not serve the purpose because of danger of breakage of gear teeth upon movement of the delivery into cooperative position relatively to the press and because proper meshing of the gear teeth would be interfered with by the raising and lowering or bodily shifting movement of the cylinder during operation of the press.

I provide means for transmitting power between the cylinder and delivery conveyor enabling driving of the conveyor direct from the cylinder when the press and delivery are assembled yet

which allows for the raising and lowering of the cylinder during operation of the press and also obviates the possibility of breaking gear teeth upon power operation of the delivery toward the press. I provide a resilient geared driving connection between the cylinder and the delivery conveyor. Upon movement of the delivery toward the cylinder the driving connection engages but is yieldable to prevent damage if the gear teeth do not immediately mesh. Also the connection is so designed that power will be transmitted therethrough continuously during the operation of the apparatus despite the bodily vertical oscillation of the cylinder.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention, in which

Figure 1 is a fragmentary diagrammatic side elevational view of printing apparatus showing the cylinder of a printing couple and a delivery cooperable therewith, the delivery being shown in operative position;

Figure 2 is a view similar to Figure 1 but showing the delivery moved away from the press to inoperative position;

Figure 3 is a fragmentary view partly in elevation and partly in longitudinal vertical cross section through the driving connections between the cylinder and delivery conveyor;

Figure 4 is a fragmentary generally horizontal cross-sectional view taken on the line IV—IV of Figure 3;

Figure 5 is a fragmentary generally horizontal cross-sectional view taken on the line V—V of Figure 3; and

Figure 6 is a fragmentary generally horizontal cross-sectional view taken on the line VI—VI of Figure 3.

Referring now more particularly to the drawings, the apparatus shown comprises a printing press of the flat bed and cylinder type and a delivery for delivering sheets from the press to a pile. It is to be understood that the word "printing" as used herein comprehends not only the application of ink to sheets but also analogous treatment thereof customarily performed in similar apparatus, as, for example, cutting and creasing.

The printing cylinder is designated generally by reference numeral 2. It comprises the usual cylinder bearer 3 and a ring gear 4 for driving the endless delivery conveyor presently to be de-

scribed. The bearer 3 and ring gear 4 are coaxial with the cylinder 2. The cylinder 2 cooperates with an oscillating flat bed, as well known in the art, to print sheets one by one. During operation of the press the cylinder rotates continuously in the counter-clockwise direction viewing Figures 1, 2 and 3. The cylinder makes one revolution for each stroke of the bed in each direction so that for each cycle of the bed the cylinder makes two revolutions. The cylinder receives a sheet from a suitable feeder and carries the sheet down into engagement with the form on the bed as the form moves toward the right on the printing stroke. At such time the cylinder is down in cooperative position relatively to the bed with the cylinder bearers in contact with the bed bearers. By the time the bed reaches the righthand end of its stroke the sheet has been printed. The bed reverses and moves back to the left and the cylinder is bodily raised during the return movement of the bed and the printed sheet is stripped from the cylinder and is carried away by the delivery conveyor. Thus during operation of the press the cylinder is bodily movable up and down in addition to its rotary movement. The means for bodily moving the cylinder up and down are well known in the art and comprise generally vertically shiftable mounting means in which the cylinder is rotatably mounted and means operated from the press drive for shifting the mounting means up and down.

The delivery is designated generally by reference numeral 5. It is movable toward and from the press in a straight line. The movement is accomplished by power means, as, for example, an electric motor and suitable connections. In Figure 1 the delivery is shown in operative position relatively to the press. In Figure 2 the delivery is shown in inoperative position relatively to the press, having been moved toward the left out of operative position. The delivery may be of the type shown in copending application Serial No. 353,871 embodying a tape arm 6 pivoted at 7 and adapted to be raised by an operating member 8 when the delivery moves away from the press. In the structure shown in said application the delivery moves a predetermined distance away from the press with the tape arm in horizontal position as shown in Figure 2 and further movement of the delivery away from the press results in swinging of the tape arm generally upwardly into an out of the way position in the counter-clockwise direction about the axis of the pivot 7 viewing Figure 2. However, the present invention is not concerned with whether or not the tape arm is swung upwardly. Mounted in the tape arm are upper tapes 9 and lower tapes 10 constituting the endless delivery conveyor above mentioned and which during operation of the apparatus carry the sheets between them from right to left viewing Figures 1, 2 and 3.

The present invention has to do particularly with the driving connections between the delivery conveyor and the press. Hence no attempt has been made to show the details of the structure of the press and delivery with which the present invention is not concerned.

To prevent damage to the parts when the delivery is power operated toward the press to bring it into the position of Figure 1 and to enable continuous driving of the delivery conveyor or tapes from the cylinder despite the up and down shifting movement of the cylinder during operation of the press I provide driving means now to be

described. Each of the upper tapes 9 extends about a shaft 11 and an idler pulley 12. Each of the lower tapes 10 extends about a shaft 13 and an idler pulley 14. Fixed to the shaft 11 is a spur gear 15. Fixed to the shaft 13 is a spur gear 16. A pinion 17 meshes with the gear 15 and a pinion 18 meshes with the gear 16. The pinions 17 and 18 also mesh with each other. A gear 19 fixed to a shaft 20 meshes with the pinion 18. Also fixed to the shaft 20 is a gear 21. The gears 19 and 21 are identical and are fixed to the same shaft and may be considered as parts of the same gear.

Disposed about the gear 21 and rotatable about the axis of the shaft 20 upon bearings 22 is a mounting member 23. Journaled within the mounting member 23 by bearings 24 is a floating gear 25 which meshes with the gear 21. The gear 25 is carried by a shaft 26, which shaft also carries outside the mounting member 23 a positioning roller 27. The mounting member 23 has a projection 28 provided with a bore 29. A rod 30 whose outside diameter is materially less than the diameter of the bore 29 extends within such bore and is pivoted to the projection 28 by a pin 29a whose axis is parallel to the axis of the shaft 26. The rod 30 passes loosely through a bore 31 in a stud 32 rotatably mounted in the frame. Interposed between the projection 28 and the stud 32 is a compression spring 33. Fastened to the end of the rod 30 by a set screw 34 is a head or stop member 35 adapted when the rod moves toward the right viewing Figure 3 to limit such movement by engagement with the stud 32. The spring 33 urges the mounting member 23 to turn in the clockwise direction about the axis of the shaft 26. When the delivery is in operative position relatively to the press the gear 25 meshes with the ring gear 4 and the positioning roller 27 rides on the cylinder bearer 3.

When the delivery is away from the press as shown in Figure 2 the gear 25 is of course out of mesh with and separated from the cylinder gear 4 and the spring 33 urges the mounting member 23 to turn in the clockwise direction about the axis of the shaft 26 until the head 35 engages the stud 32. When the parts are in such position the axis of the shaft 26 is slightly lower than the axis of the shaft 20, as shown in Figure 2. When the delivery is moved from the position of Figure 2 to the position of Figure 1 the gear 25 engages the gear 4 somewhat before the delivery has completed its movement, such engagement resulting in upward swinging of the mounting member 23 about the axis of the shaft 20 and compression of the spring 33. Thus even if the teeth of the gears 25 and 4 do not immediately mesh the gears will not be damaged since the gear 25 will yield as above described. The teeth will come into mesh and the delivery tapes will be driven by the cylinder gear 4 through the connections above described. The positioning roller 27 riding on the cylinder bearer 3 insures proper meshing of the teeth of the gears 25 and 4. As the cylinder moves up and down during operation of the press the mounting member 23 will swing back and forth about the axis of the shaft 20, the gear 25 always remaining in mesh with the gears 4 and 21.

There is shown diagrammatically in Figures 1 and 2 a stripper 36 which is carried by the delivery tape arm and cooperates with the cylinder to strip sheets therefrom in well known manner. Also there are shown spring mounting means 37

for the idler pulleys 12 and 14. This structure forms no part of the present invention.

While in the embodiment of the invention above described the press is stationarily mounted and the delivery moves toward and from the press the contrary might be true or the press and delivery might both move. Also, while the delivery is preferably driven from the press the driving connections shown and described might be employed for driving the press from the delivery if the parts be suitably designed. While the floating gear 25 is connected with the delivery such gear might, if desired, be connected with the press and float about the axis of the cylinder 2 instead of about the axis of the shaft 20.

The invention provides a highly useful and simple positive drive between the cylinder and the delivery conveyor which may be automatically engaged and disengaged upon assembly and separation of the delivery and press without danger of damage to the gearing and which also operates to transmit power continuously during operation of the apparatus despite the up and down movement of the cylinder.

While I have shown and described a present preferred embodiment of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. Material handling apparatus comprising driving means and material handling means which are relatively bodily separable and relatively bodily power operated to assembled position in which the material handling means is adapted to be driven by the driving means, one of the driving means and material handling means having a gear and the other having a pair of gears, one meshing with said first mentioned gear when the driving means and material handling means are assembled and with the second of said pair and mounted to swing about the axis of said second gear.

2. Material handling apparatus comprising driving means and material handling means which are relatively bodily separable and assembleable to a position in which the material handling means is adapted to be driven by the driving means, one of the driving means and material handling means having a swingably yieldable driving portion adapted upon assembly of the driving means and the material handling means to engage a cooperating driving portion of the other of said means prior to the time when the driving means and material handling means reach fully assembled position and after said engagement to swing yieldably into drive transmitting relation with said cooperating driving portion.

3. Material handling apparatus comprising driving means and material handling means which are relatively bodily separable and assembleable to a position in which the material handling means is adapted to be driven by the driving means, one of the driving means and material handling means having a gear and the other having a yieldably mounted gear adapted to mesh with the first mentioned gear when the driving means and material handling means are assembled and drive transmitting means connected with said yieldably mounted gear.

4. Material handling apparatus comprising driving means and material handling means which are relatively bodily separable and as-

sembleable to a position in which the material handling means is adapted to be driven by the driving means, one of the driving means and material handling means having a gear and the other having a floating mounting carrying a gear adapted to mesh with the first mentioned gear when the driving means and material handling means are assembled, means acting on said mounting to urge said second mentioned gear into mesh with the first mentioned gear when the driving means and material handling means are assembled and drive transmitting means connected with said second mentioned gear.

5. Material handling apparatus comprising driving means and material handling means which are relatively bodily separable and assembleable to a position in which the material handling means is adapted to be driven by the driving means, one of the driving means and material handling means having a gear and the other having a pivot, a mounting member swingably carried by said pivot, a gear carried by said mounting member adapted to mesh with the first mentioned gear when the driving means and material handling means are assembled, means acting on said mounting member to urge said second mentioned gear into mesh with the first mentioned gear when the driving means and material handling means are assembled, a drive transmitting member coaxial with said pivot and a drive transmitting connection between said second mentioned gear and said drive transmitting member.

6. Material handling apparatus comprising driving means and material handling means which are relatively bodily separable and assembleable to a position in which the material handling means is adapted to be driven by the driving means, one of the driving means and material handling means having a gear and the other having a pivot, a mounting member swingably carried by said pivot, a gear carried by said mounting member adapted to mesh with the first mentioned gear when the driving means and material handling means are assembled, means acting on said mounting member to urge said second mentioned gear into mesh with the first mentioned gear when the driving means and material handling means are assembled, and a third gear coaxial with said pivot and meshing with said second mentioned gear.

7. Material handling apparatus comprising driving means and material handling means which are relatively bodily separable and assembleable to a position in which the material handling means is adapted to be driven by the driving means, one of the driving means and material handling means having a gear and the other having a floating mounting carrying a gear adapted to mesh with the first mentioned gear when the driving means and material handling means are assembled, the mounting having a projection, a spring engaging said projection to tend to move the mounting to urge said second mentioned gear into mesh with the first mentioned gear when the driving means and material handling means are assembled and drive transmitting means connected with said second mentioned gear.

8. Material handling apparatus comprising bodily oscillatably mounted rotary power transmitting means, material handling means and driving connections between the power transmitting means and the material handling means, said connections including a resiliently mounted power transmitting member adapted to maintain power transmitting relation with said rotary power

transmitting means during oscillation thereof and means transmitting power between said member and the material handling means.

9. Material handling apparatus comprising bodily oscillatably mounted rotary power transmitting means, material handling means and driving connections between the power transmitting means and the material handling means, said connections including a power transmitting member adapted to maintain power transmitting relation with said rotary power transmitting means during oscillation thereof and means with which said power transmitting member also maintains power transmitting relation during oscillation of said rotary power transmitting means and transmitting power between said member and the material handling means.

10. Material handling apparatus comprising bodily shiftable mounting means, power transmitting means rotatably carried by said mounting means, material handling means and driving connections between the power transmitting means and the material handling means, said connections including a power transmitting member adapted to maintain power transmitting relation with said power transmitting means during shifting of said mounting means and means with which said power transmitting member also maintains power transmitting relation during shifting of said mounting means and transmitting power between said member and the material handling means.

11. Material handling apparatus comprising bodily shiftable mounting means, power transmitting means rotatably carried by said mounting means, material handling means and driving connections between the power transmitting means and the material handling means, said connections including a floatingly mounted power transmitting member adapted to maintain power transmitting relation with said power transmitting means and said material handling means during shifting of said mounting means and means yieldably urging said power transmitting member toward operative position but allowing bodily movement thereof relatively to said power transmitting means upon shifting of said mounting means.

12. Material handling apparatus comprising a rotatable and also bodily shiftable gear, material handling means and means for transmitting power between said gear and said material handling means, said power transmitting means including a second gear meshing with the first gear and mounted for bodily movement upon shifting of the first gear and a power transmitting member connected with said second gear transmitting power between said second gear and said material handling means.

13. Material handling apparatus comprising a rotatable and also bodily shiftable gear, material handling means and means for transmitting power between said gear and said material handling means, said power transmitting means including a second gear mounted in said material handling means and a third gear mounted so as always to mesh with said first gear and said second gear despite bodily shifting of said first gear.

14. Printing apparatus comprising a printing cylinder which is rotatable and also bodily shiftable, sheet handling means cooperable with said cylinder and power transmitting means for transmitting power between said cylinder and said sheet handling means comprising a power transmitting member adapted to maintain power

transmitting relation with said cylinder despite bodily shifting thereof and means adapted to maintain power transmitting relation with said power transmitting member and with said sheet handling means.

15. Printing apparatus comprising a printing cylinder which is rotatable and also bodily shiftable, the cylinder having a bearer, sheet handling means cooperable with the cylinder and power transmitting means for transmitting power between the cylinder and sheet handling means comprising a portion adapted to bear against the cylinder bearer despite bodily shifting thereof, said portion being itself bodily shiftable.

16. Printing apparatus comprising a cylinder, a gear coaxial with the cylinder, sheet handling means, a second gear in power transmitting relation to the sheet handling means and a third gear mounted for bodily shifting movement about the axis of the second gear meshing with both of the first and second gears to transmit power between the first gear and the sheet handling means.

17. Printing apparatus comprising a cylinder, a gear coaxial with the cylinder, sheet handling means, a second gear in power transmitting relation to the sheet handling means, a third gear mounted for bodily shifting movement about the axis of the second gear meshing with both of the first and second gears and means urging the third gear into mesh with the first gear.

18. Printing apparatus comprising a cylinder which is rotatable and also bodily shiftable, a gear carried by the cylinder and coaxial therewith, sheet handling means, a second gear in power transmitting relation to the sheet handling means, a third gear mounted for bodily shifting movement about the axis of the second gear meshing with both of the first and second gears and means urging the third gear into mesh with the first gear in any position of the cylinder.

19. Printing apparatus comprising a cylinder having a bearer and carrying a gear which is coaxial with the cylinder, sheet handling means, a second gear in power transmitting relation to the sheet handling means, a third gear mounted for bodily shifting movement about the axis of the second gear meshing with both of the first and second gears, guide means concentric with the third gear bearing on the bearer and means urging the third gear into mesh with the first gear.

20. Printing apparatus comprising a cylinder and sheet handling means which are relatively bodily separable and assembleable to a position in which the sheet handling means is adapted to be driven by the cylinder, one of the cylinder and sheet handling means having a yieldable driving portion adapted upon assembly of the cylinder and sheet handling means to engage a cooperating driving portion of the other of said means prior to the time when the cylinder and sheet handling means reach fully assembled position and after said engagement to move yieldably into drive transmitting relation with said cooperating driving portion.

21. Printing apparatus comprising a printing couple including a printing cylinder, sheet handling means cooperable therewith, the printing couple and sheet handling means being relatively bodily separable and relatively bodily power operated to assembled position in which the sheet handling means is adapted to be driven by the cylinder and a resilient driving connection between the sheet handling means and cylinder.

22. Sheet handling apparatus comprising a

cylinder, an endless conveyor adjacent the cylinder and adapted for movement into and out of position to be driven by the cylinder and a resilient geared driving connection between the cylinder and conveyor.

23. Printing apparatus comprising a printing couple including a rotatable and also bodily shiftable cylinder having a gear and a bearer coaxial therewith, an endless sheet conveyor which is separatable from and power operated to assembled position relatively to the cylinder and adapted to be driven by the cylinder when assembled

therewith and driving connections between the cylinder and conveyor including a second gear on the conveyor, a mounting member swingable about the axis of said second gear, a third gear 5 carried by said mounting member and adapted when the cylinder and conveyor are assembled to mesh with both the first gear and the second gear, a positioning member coaxial with the third gear bearing upon the cylinder bearer and means for 10 urging the third gear into mesh with the first gear.

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