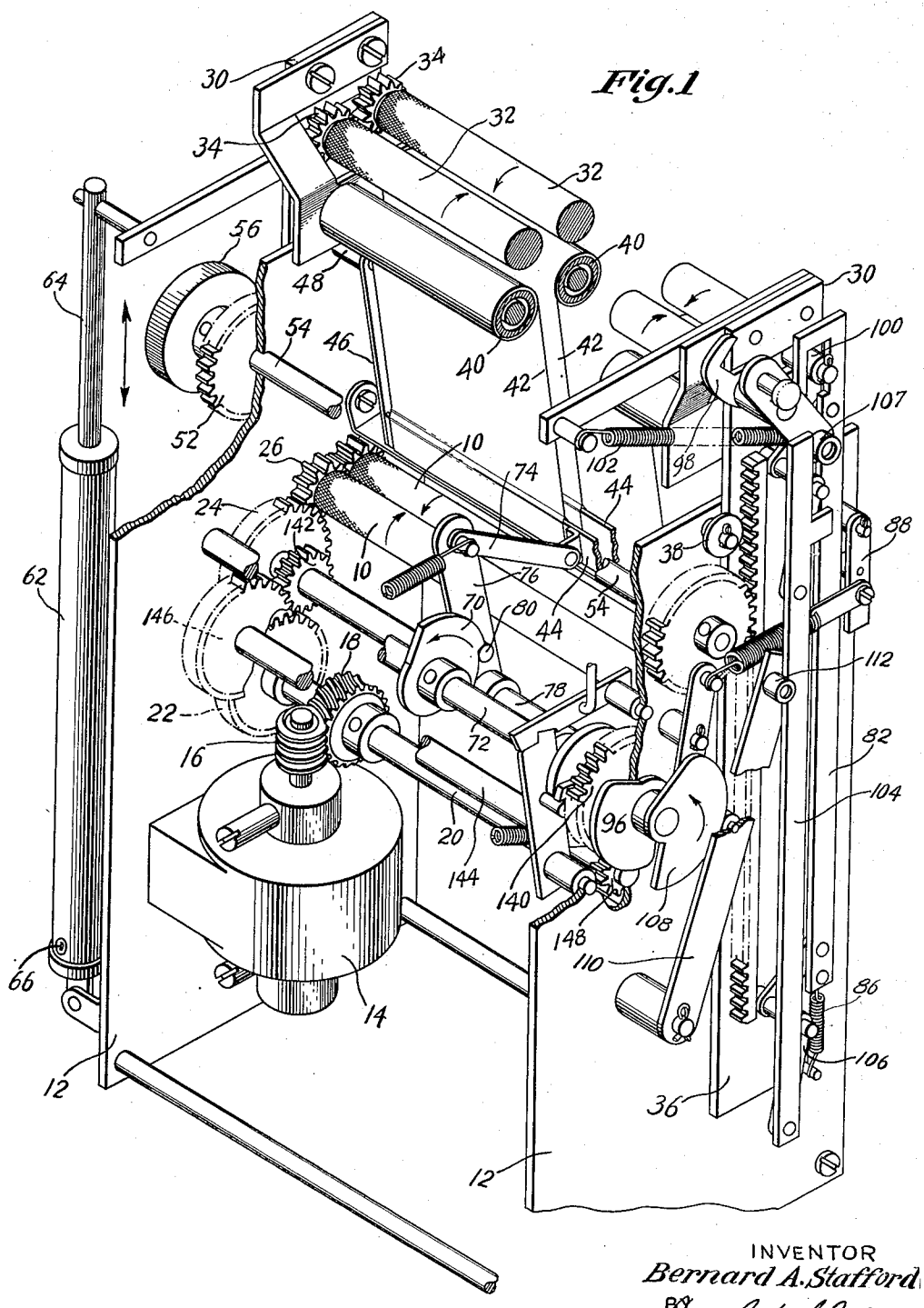
Aug. 18, 1953 B. A. STAFFORD 2,649,156

SNAP-OUT FORM SEPARATING DEVICE

Filed June 8, 1951 4 Sheets-Sheet 1

Fig. 1



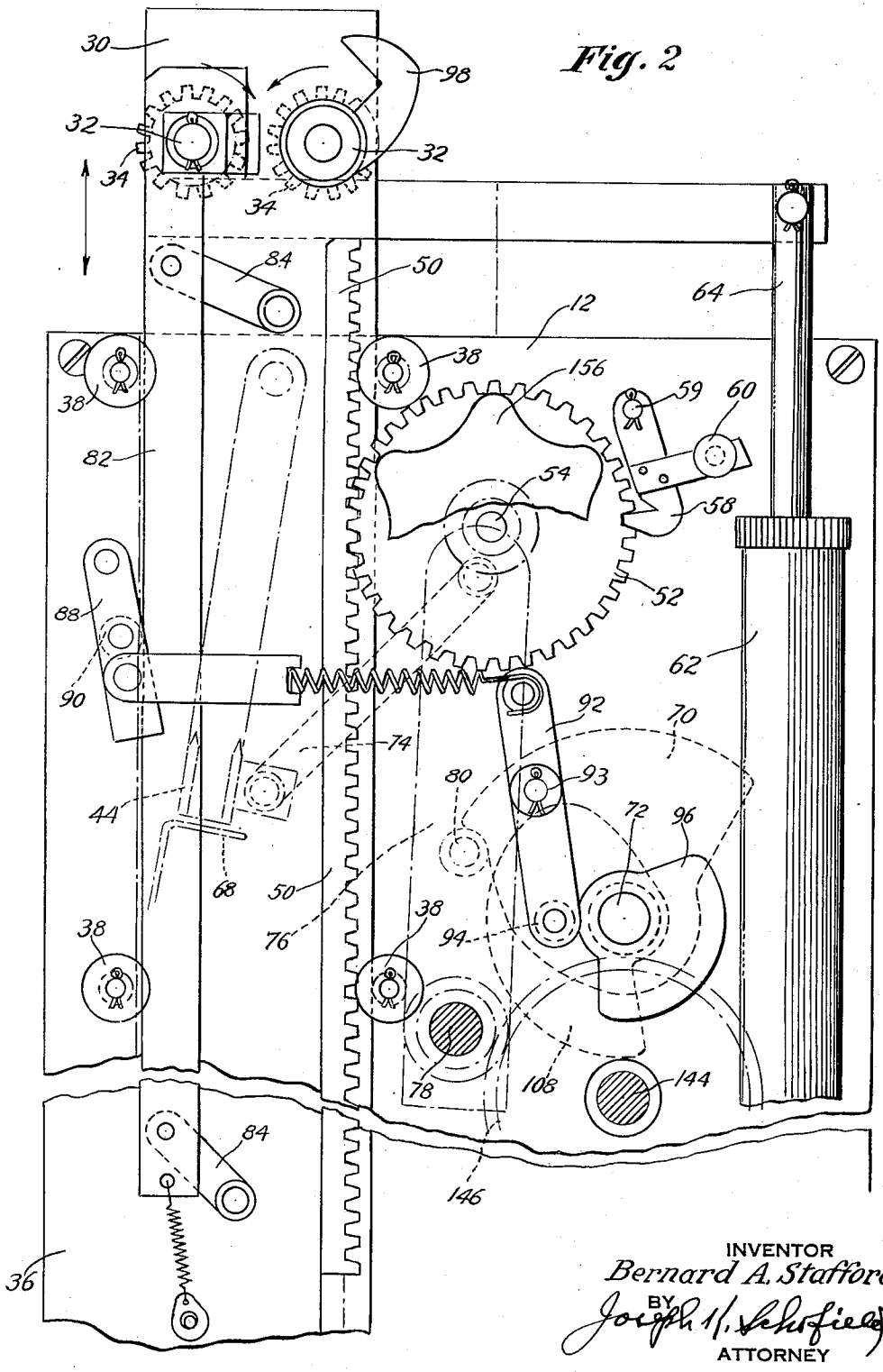
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SNAP-OUT FORM SEPARATING DEVICE

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Fig. 2



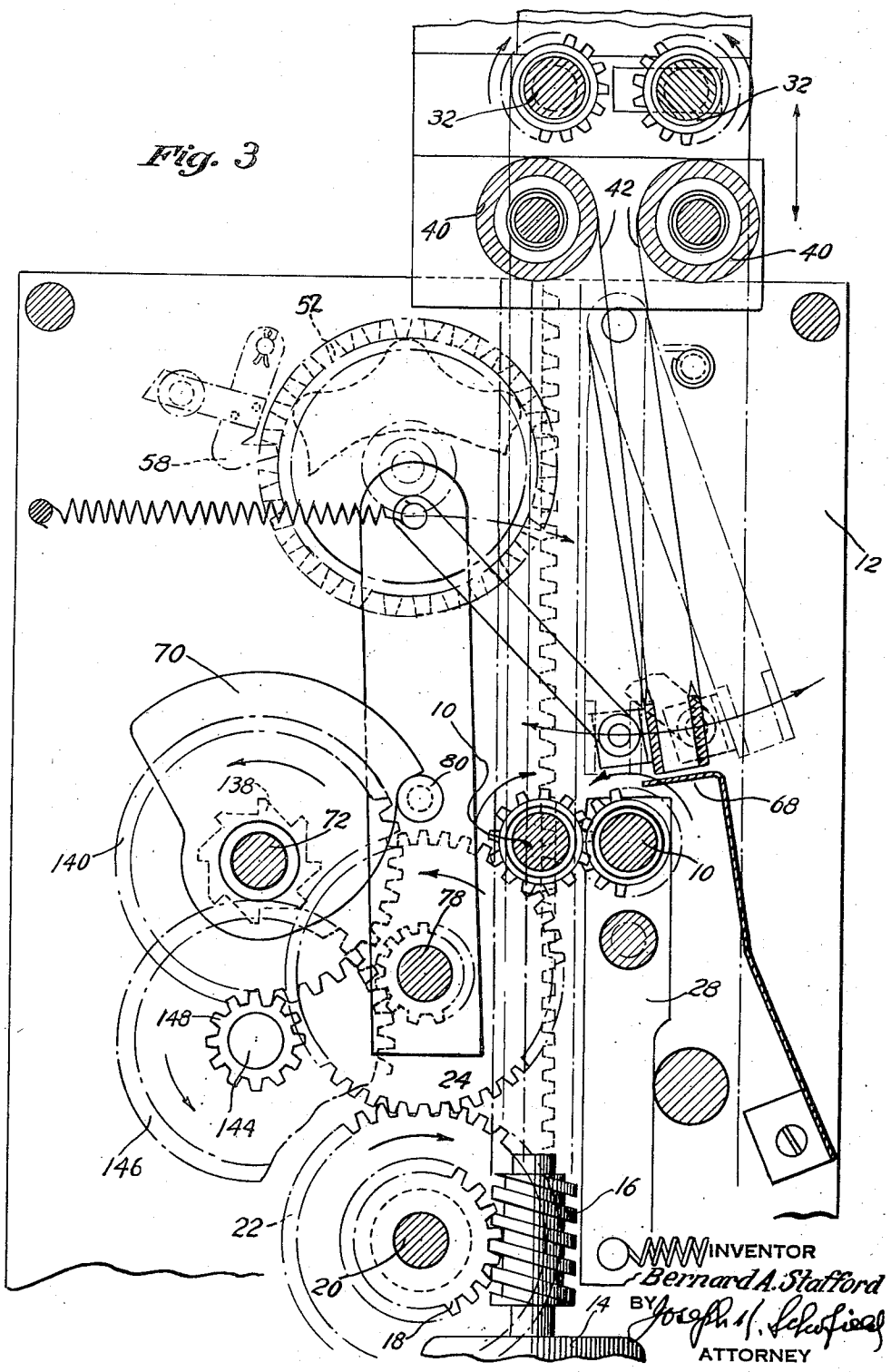
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SNAP-OUT FORM SEPARATING DEVICE

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Fig. 3

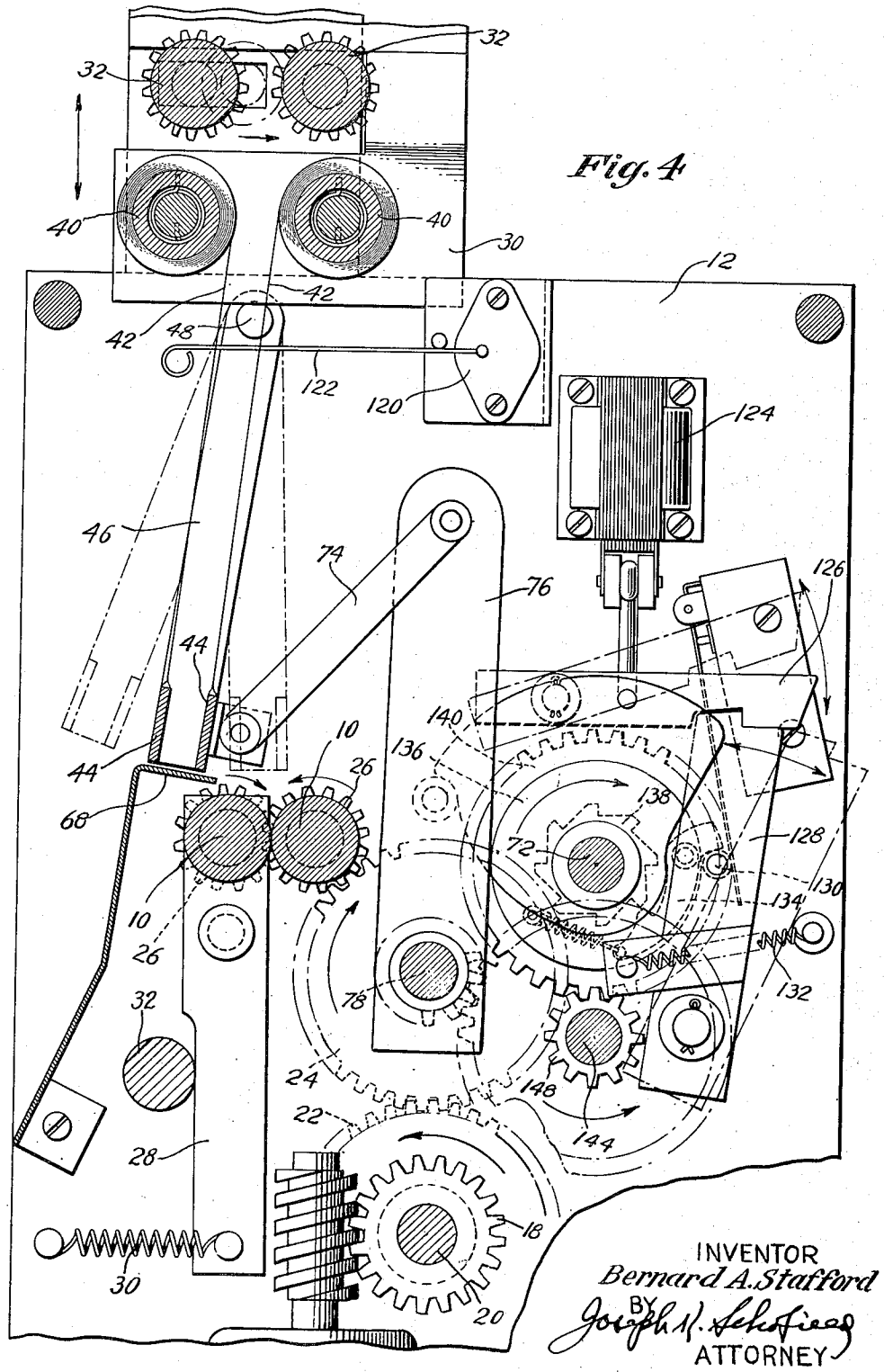


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SNAP-OUT FORM SEPARATING DEVICE

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Fig. 4



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SNAP-OUT FORM SEPARATING DEVICE

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Application June 8, 1951, Serial No. 230,525

12 Claims. (Cl. 164—84.5)

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This invention relates to a device for separating form sheets from a snap-out assembly comprising a plurality of form sheets interleaved with carbon sheets, the assembly having all of its sheets attached together, as by gumming or stitching, along an end or side to form a pad.

The snap-out pads of business forms adapted for separation by this device comprise pad-like assemblies containing from three to twelve or more, similar form sheets interleaved with single-use carbon sheets. The carbon sheets and form sheets are secured together along one end by being gummed or stitched together and the form sheets are provided with a line of perforations adjacent the end at which they are gummed or stitched to the carbon sheets. The form sheets also extend slightly beyond the edges of the carbon sheets at the end of the pad opposite the gummed or stitched end so that gripping members may clamp the free ends of the form sheets without gripping or engaging the free ends of the carbon sheets. By engaging the header end of the assembly between rotating adjacent parallel rolls while the opposite end of the assembly has its form sheets beyond the ends of the carbons held by the clamping members, the carbon sheets and the header may be severed from the form sheets along the lines of perforations on the individual form sheets.

At the present time the conventional method of severing or snapping out the form sheets from an assembly such as described above is to manually grasp the opposite ends of an assembly as close to their edges as possible and sever the form sheets from the carbons and header with a strong, quick separating movement of the hands. This is generally satisfactory when the number of form sheets is low and there is enough margin between the free ends of the form sheets and those of the carbons to obtain a firm grasp. With the number of form sheets from about eight to twelve or more, however, the manual severing of the form sheets becomes increasingly difficult and the liability of tearing or mutilating the form sheets is much greater. It is therefore an object of the invention to effect by power driven means an operation previously accomplished manually.

A primary object of the invention is to provide means for gripping the header end of the snap-out form and also for gripping the end opposite the header at a point beyond the interleaved carbon sheets so that by actuating one of the gripping means the header and carbon sheets may be severed from the form sheets along the lines

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of perforations formed adjacent the header ends of the form sheets.

Another object of importance of the invention is to provide novel guiding means for the assembly to first present the assembly in a definite position for engagement by clamping members of the extended ends of the form sheets, then oscillating the guiding means to present the header end of the assembly between rolls gripping this header end and by rotation of the rolls to sever the header end and carbon sheets from the form sheets along the perforations on the form sheets.

Another object of the invention is to move the guiding means after the header end and carbon sheets have been severed from the form sheets to a position to permit the form sheets to drop into a delivery chute or container, the gripping members at this time having been separated to release engagement of the extended ends of the form sheets.

Another object of the invention is to provide a device for separating form sheets from a snap-out assembly in which a pair of constantly rotating rolls is provided in the body member of the device and providing gripping members, which also may be in the form of rolls, on an adjustable frame so that by positioning the frame the device may be adapted for operation on snap-out forms of any length.

And finally it is an object of the invention to provide a timed cycle of operations initiated by contact of the header end of the snap-out assembly when dropped into the device, the header end contacting a micro-switch to first move the clamping members into gripping position, then by movement of the guiding means present the header end of the form to the rotating rolls while their free ends are still clamped to sever the header and carbon sheets from the form sheets, and thereafter move the guiding means to a third or delivery position of the form sheets, then separate the clamping means to permit the form sheets to drop from the device, and then stop further operation of the device.

With the above and other objects in view, the invention may include the features of construction and operation set forth in the following specification and illustrated in the accompanying drawings.

In the accompanying drawings annexed hereto and forming a part of this specification, I have shown the invention embodied in a snap-out form separating device in which the complete forms or pads are dropped vertically into the device and the form sheets after being severed from the car-

bons are delivered as a group separate from the carbons, but it will be understood that the invention can be otherwise embodied and that the drawings are not to be construed as defining or limiting the scope of the invention, the claims appended to this specification being relied upon for that purpose.

In the drawings:

Figure 1 is a perspective view of a device made according to the present invention and showing the principal operative parts thereof;

Figure 2 is a side elevation of the device shown in Figure 1, the view being taken from the left side of the device as seen in Figure 1.

Figure 3 is a side elevation taken from the inside of the end shown in Figure 2; and

Figure 4 is a side elevation taken from the inside and showing the end opposite that shown in Figure 3.

In the above-mentioned drawings there has been shown but one embodiment of the invention which is now deemed preferable, but it is understood that changes and modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

The invention may include the following principal parts: First, a body member in which rolls are mounted in horizontal parallel positions and constantly rotated closely adjacent each other; second, an adjustable frame movable toward and from the body member; third, a pair of clamping members which may be in the form of rolls in said adjustably positioned frame and movable directly toward and from each other during the cycle of operations of the device and adapted to grip the extended ends of the form sheets beyond the edges of the carbon sheets; fourth, guiding means extending from adjacent the clamping members in said adjustable frame to a position adjacent the rotating rolls; fifth, cam means to oscillate the guiding means to different operative positions in accordance with a predetermined cycle of operations; sixth, means to actuate the clamping members into clamping position as soon as the pad or form assembly has reached its initial position determined by the guiding means; seventh, means to advance the pad to engage its forward edge with said rolls; and eight, means to release the clamping members and advance the guiding members to an extreme forward oscillated position to move the form sheets detached from the pad to a delivery position.

Referring more in detail to the figures of the drawings and first to Figs. 1 and 4, it will be seen that a pair of rolls 10 are mounted horizontally between side plates 12 of the device to rotate closely adjacent each other. To continuously rotate the rolls 10 one of the rolls is driven through gearing from a vertically disposed motor 14 mounted in fixed position against one of the side plates 12. A worm 16 on the armature shaft of the motor meshes with a worm gear 18 on a shaft 20 on one end of which is a spur gear 22 meshing with an intermediate gear 24 also of spur type which in turn is in mesh with a pinion 26 on one end of one of the rolls 10. This roll 10 is rotated upon a fixed axis in suitable bearings provided in the side plates 12 of the device. The companion roll 10 is driven from the first roll through a companion pinion meshing with the pinion 26 on the first roll.

In order to resiliently press these rolls 10 toward each other constantly and with a uniform force, the second roll is mounted at its opposite ends upon the upper ends of levers 28 (see Fig. 4) supported for pivotal movement in the side plates 12. The lower ends of the levers 28 are forced by suitable springs 30 in a direction so that the second roll 10 is constantly forced toward its companion roll. The roll 10 mounted on the pivotal levers 28 is thus permitted to move slightly from the first roll against the force of springs 30 when snap-out pad assemblies are forced between adjacent portions of their peripheries. The rolls 10 along their length may be knurled or otherwise roughened to provide frictional engagement with a snap-out assembly as it is being forced between the rolls 10. To limit the movement of the rolls 10 toward each other the pivoted levers 28 engaging opposite ends of the second roll 10 may have one of their edges normally engaging against a stop 32 or abutment formed on each of the side plates 12 of the device. In operation these rolls 10, which preferably are of equal diameter, are continuously rotated at a constant speed while the device is being used.

Adjustably mounted for vertical movement relative to the side plates 12 is a frame member 30 having adjacent its upper end a pair of closely parallel horizontal rolls 32 generally similar to rolls 10 mounted in the side plates. These rolls 32 are mounted at their ends in suitable bearings formed within the frame member 30, the bearings for one of the rolls being slidably adjustable toward and from the other. The rolls 32 also are adapted for rotation together by intermeshing gears 34 at one end. One of the rolls 32 is mounted on a fixed axis by bearings provided directly in the frame 30. Its companion roller is mounted in bearings slidably movable toward and from the bearings for the fixed axis roll by means and for a purpose presently to be described. The frame 30 is provided with vertical side strips 36 engaging against the outer surfaces of the side plates 12 and guided between spaced small flanged rollers 38 on the outer surfaces of the side plates 12.

Also mounted on this vertically adjustable frame 30 are rollers 40 resiliently forced rotatably in a direction to wind flexible sheet material 42 about the rolls by the resiliency of the springs housed within the rolls. The lower ends of these strips 42 are attached to parallel spaced apart rods 44 mounted on and forming the lower part of a swinging guide frame 46. In order to pivotally mount this swinging frame 46, its side members at their upper ends are attached to pivots 48 outstanding from the inside surfaces of the side plates 12. These pivots 48 are in alignment with each other and positioned slightly below the rolls 32. The lower ends of the side members are rigidly attached to the bars or rods 44. This swinging frame 46 therefore provides a slot between the sheets of flexible material 42 through which a snap-out form may be dropped and, due to the strip material 42 wrapped on the rolls 40, vertical adjustment of the frame 30 by unwrapping the material from around the rolls 42 elongates the sides of this guideway to continuously guide the form.

Manual means are provided for vertically adjusting the frame 30 to accommodate different lengths of forms. For this purpose racks 50 are provided fixed to opposite sides of the frame and lying closely adjacent the outer surfaces of the side plates 12. Meshing with these racks are gears 52 on the opposite ends of a shaft 54 extending horizontally between the side plates 12. This shaft 54 may, as shown, be mounted in openings provided directly in the side plates. A

knob 56 on one end of the shaft 54 permits adjustment of the frame 30 to any desired vertical position.

A detent 58 is provided to maintain the frame 30 in any adjusted position and to prevent lowering the frame 30 accidentally. This detent 58 is in the form of a small lever pivotally mounted on a pin 59 on one of the side plates 12. This lever 58 has its free end formed to engage between the teeth of one of the gears 52 and may if desired, be spring-pressed to its gear engaging and frame locking position. To lower the frame 30 it is only necessary to disengage the detent 58 by knob 60 which will permit the frame 30 to drop by gravity. A cushioning means may be provided to prevent the sudden dropping of the frame 30. A cylinder 62 is mounted on the lower portion of one of the side plates 12 and a piston rod 64 movable within the cylinder is attached at its upper end to the frame 30. A needle or other form of valve 66 at the lower end of the cylinder 62 limits the escape of air from the cylinder when the frame 30 drops, thus retarding its downward movement.

The swinging guide 46 has three positions to which it is actuated by suitable cam mechanism presently to be described (see Fig. 4). In its initial or intermediate position the guideway for the snap-out form has the bars 44 at its lower or free end disposed directly above a horizontal platform or abutment 68 against which the head end of the form abuts when the form is dropped between the upper pair of rollers 32, and between the flexible members 42 to initiate the snap-out operation. As soon as the form is in position with its head end against abutment 68 and its upper end has its form sheets gripped between the rolls 32, the swinging guide 46 oscillates to a position to bring the head end of the form directly over and between the lower or rotating pair of rolls 10. While the guide 46 is in this oscillated position the form sheets are severed from the header and carbons and these carbons with their headers pass between the rolls 10 and drop from below the rolls. The form sheets at this time are still firmly held between the upper rollers 32. The third and final position of the guide 46 is at an extreme forward position so that with the guide in this forward position and with the upper rolls 32 separated, the form sheets may drop into a suitable receptacle (not shown) below and in front of the device.

Oscillating movements of this swinging guide 46 are controlled by means of a face cam 70 on a horizontal transverse shaft 72. One revolution of this shaft 72 started and stopped by means presently to be described, effects a complete cycle of operation of the swinging guide 46.

The lower end of the swinging frame 46 has attached at an intermediate part of one of the bars 44 an arm 74, one end of the arm 74 being attached to one end of a lever 76. The opposite end of the lever 76 is pivotally and rotatably connected to a shaft 78 extending transversely and horizontally between the side plates 12. At an intermediate point along the length of this lever 76 is a cam follower 80 engaging the periphery of the cam 70. The outline of the cam is such that during a rotation of cam shaft 72 at uniform speed the swinging frame is oscillated to the three positions indicated with the proper dwells at each position.

One of the upper rolls 32, carried by the vertically adjusted frame 30, is moved toward the other roll in any vertical position of the frame by the following means. The side strips 36 of the frame 30 carry elongated bars 82 mounted for movement to different parallel positions by short parallel links 84. These bars at their upper ends are provided with hook portions between the arms of which the extended ends of the movable roll 32 extend. Movement therefore of the bars 82 laterally on opposite sides of the frame 30 will move the movable roll 32 toward and from the opposite fixed roll. The bars 82 are resiliently pressed by a suitable spring 86 in a direction to retain the movable roll 32 spaced from its companion fixed roll.

To move the laterally movable roll 32 toward the fixed roll an arm 88 on the outside of each side plate 12 is pivoted at its upper end to its side plate 12 and at its intermediate end has a roller 90 bearing against a longitudinal edge of the rods 82. Levers 92 pivotally mounted on each side plate 12 at intermediate portions as at 93 have their upper ends attached by means of springs to the levers 88 and the lower ends of levers 92 have rollers 94 bearing against the periphery of cams 96 on shaft 72, on the outside the side plates 12. It will be seen by the above described mechanism that rotation of the cam shaft 72 will oscillate levers 92 and advance the movable roll 32 toward its companion fixed roll in accordance with the outline of the cams 96. The timing of the movement of the roll 32 toward and from clamping position is determined by the outline and angular position of the cams 96 on their shaft 72.

The above described means effect the movement of the movable roll 32 toward its companion roll prior to firmly forcing the movable roll toward the other with sufficient pressure to effect a firm clamping of the form sheets while they are being severed from the header and carbon sheets. To effect this final clamping pressure, arms or levers 98 secured to the opposite ends of the fixed roll 32 are oscillated with partial rotation of the fixed roll 32 to engage a cylindrical surface 100 at the end of the adjustable roll. The levers 98 are formed with hooked ends so that oscillation of the levers 98 engages the hooked ends of these levers over the cylindrical surfaces 100 on the movable rolls 32. The shape of the hooked portion of the levers 98 is such that as the levers 98 complete their oscillation to engage the surfaces 100 there is a forcing of the movable roll 32 toward its companion roll. The levers 98 are resiliently forced toward their oscillated position by a coil spring 102 on one side of the device. The two rolls 32 are geared together by small gears 34 as described above at one end so that partial rotation of the fixed roll 32 effects similar rotation of its companion roll.

On one of the side strips 36 of the frame 30 is a rod 104 (see Fig. 1) movable to different parallel positions by being mounted on short parallel links 106. At the upper end of this rod 104 is an extension bearing against roller 107 on the extended end of the lever 98 so that when the vertical bar 104 is moved downward and past the axis of the roll 107 the lever 98 is released from its clamping position. To move this bar 104, a cam 108 rotatable with the cam shaft 72 oscillates a lever 110 pivotally mounted at its lower end to the side plate 12 and having a roller 112 at its upper or free end bearing against one side edge of the rod 104. The shape of the periphery of cam 108 is such that the le-

ver 96 is oscillated to clamp the rolls 32 together at the proper point in the cycle of operation of the device.

The cycle of operation of the machine is initiated by a micro-switch 120 which is moved to its circuit closing position by the weight of the snap-out form contacting its lever 122 which extends into the path of movement of the form when dropped between the rollers 32 and the guideway formed between the sheets of flexible material 42. Energizing this circuit operates solenoid 124 to release a latch 126 holding a clutch in open position. A lever 128 pivoted at its lower end to one of the side plates 12 is formed at its upper end to be interengaged with the latch member 126. Upward movement of the latch member 126 permits the lever to move outwardly by means of the coiled spring 132. In the position shown in Fig. 4 the lever is shown in full lines in its latched position. In this position a stud 130 outstanding from an intermediate part of lever 128 engages the rear extended end of a pawl 134. Pawl 134 is mounted on the face of a disc 136 and as shown is disengaged from a ratchet wheel 138 rotating with a gear 140 rotatably mounted on the cam shaft 72. Gear 140 is continuously rotated by motor 14, pinion 142 on shaft 78 and shaft 144 driven by gear 146 on shaft 144. A pinion 148 on the outer end of shaft 144 is in mesh with gear 140. With the latch member 126 removed as shown in dot and dash lines pawl 134 can engage a tooth of ratchet wheel 138 and the cam shaft 72 rotates at a low speed being driven through gearing from the shaft having gear 24 thereon. The clutch on the cam shaft through any conventional single rotation means rotates the cam shaft one complete revolution only, after which the latch member 126 is again moved to disengage the pawl 134 from its wheel. As the single rotation clutch and its operating means form no part of the present invention, further description is not thought to be necessary. It will suffice to state that when a form is dropped into the space between rollers 32 the cycle of operations is started by the micro-switch 120 to start rotation of cam shaft 72 and when this cycle is completed the cam shaft 72 is stopped.

On shaft 72 are three cams; one cam 96 moves one of the upper rolls 32 into closed position against the fixed roll to grasp the upper end of the snap-out form, a second cam 70 moves the swinging frame to position the lower edge of the snap-out form from the stationary platform to a position just above the pair of constantly rotating lower rolls 10, and the third cam 108 rotates the upper rolls while retained in closed position through a portion of a revolution to lower the snap-out form far enough to have its header end grasped by the lower rolls 10.

Continued rotation of the lower rolls 10 while rolls 32 are in closed position to clamp the upper edge of the form will separate the header and carbon sheets from the form sheets and force them between the lower rolls and drop them from below the rolls 10. During this portion of the operation the form sheets are retained between the upper rolls until the swinging frame completes its oscillating movement to an extreme forward position. While the swinging frame is in this advanced or forward position, the cam 96 releases the upper rolls allowing them to separate and permit the form sheets to drop downward in front of the device. The single rotation clutch pawl 134 is not disengaged to stop further rotation of cam shaft 72 until the above cycle of operations is completed. When the cycle has been completed and rotation of cam shaft 72 stopped the swinging frame 46 is again in position directly above the abutment 68 and the rolls 32 are separated so that they are ready to receive another form assembly.

What I claim is:

1. A device for separating form sheets from a snap-out assembly comprising a pad of interleaved form and carbon sheets, said device comprising a body member having a pair of rotating rolls, clamping means extending parallelly to the rolls and spaced from said rolls a distance determined by the length of pad, abutment means to position the assembly for clamping, and movable guiding means for said assembly to present an end thereof to said rolls, whereby when the assembly is clamped along one end by said clamping means, engagement of the opposite end between said rotating rolls will sever said form sheets from the assembly.

2. A device for separating form sheets from a snap-out assembly comprising a pad of interleaved form and carbon sheets, said device comprising a body member having a pair of continuously rotating rolls, clamping means extending parallelly to the rolls and spaced from said rolls a distance determined by the length of the pad, abutment means to position the assembly for clamping, guiding means for said assembly to present the opposite ends thereof respectively to said clamping means and rolls, whereby engagement of one end between said rotating rolls when the opposite end is engaged by said clamping means will sever said form sheets from the assembly.

3. A device for separating form sheets from a snap-out assembly comprising a pad of interleaved form and carbon sheets, said device comprising a body member having a pair of continuously rotating rolls, clamping means extending parallelly to the rolls and adjustable toward and from said rolls, said clamping means moving from unclamping to clamping positions when said sheets are positioned therebetween ready for severing, abutment means to position the assembly for clamping, and guiding means for said assembly to present an end thereof to said clamping means and the oposite end to said rolls, whereby with the assembly clamped along one edge by said clamping means, rotation of the rolls will sever said form sheets from the assembly, and means to guide said form sheets to a delivery position.

4. A device for separating form sheets from a snap-out assembly comprising a pad of interleaved form and carbon sheets, said device comprising a body member having a pair of continuously rotating rolls, clamping means extending parallelly to the rolls and adjustable toward and from said rolls to a position determined by the length of the pad, abutment means to position the assembly for clamping, means to engage an edge of said assembly between said rolls when the opposite edge is clamped, guiding means for said assembly to present an end thereof adjacent said rolls, whereby when the assembly is clamped along one edge by said clamping means and moved, engagement of opposite end by the rotating rolls will sever said form sheets from the assembly, and means to advance said form sheets and carbon sheets to separate delivery positions after severing.

5. A device for separating form sheets from

a snap-out assembly comprising interleaved form and carbon sheets, said device including a body member having a frame adjustably mounted thereon, clamping members on said frame movable toward each other, a pair of rotating rolls in said body member normally pressed together, abutment means to position the assembly for clamping, guiding means for a snap-out assembly extending from between said clamping members to said rolls, whereby rotation of said rolls when said clamping members are closed will separate said form sheets from said carbon sheets, and means to separate said clamping members after said form sheets have been severed from said carbon sheets.

6. A device for separating form sheets from a snap-out form assembly comprising interleaved form and carbon sheets, said device including a body member having rotating rolls adapted to engage the head end of said assembly, clamping members adjustable toward and from said rolls and movable toward and from each other, clamping means engaging the form sheet edges beyond the edges of said carbon sheets opposite the head end of said assembly, and guiding means movable to present said assembly to said rolls and after severing said form sheets from said carbon sheets to advance the carbon sheets to a delivering position.

7. A device for separating form sheets from a snap-out assembly comprising interleaved form and carbon sheets, said device including a body member having a frame adjustably mounted thereon, clamping members on said frame movable toward and from each other, a pair of rotating rolls in said body member normally pressed together, abutment means to position the assembly for clamping, and guiding means for a snap-out assembly extending from between said clamping members to said rolls, whereby rotation of said rolls when said clamping members are closed will separate said form sheets from said carbon sheets, said guiding means advancing said form sheets after severing to a delivery position.

8. A device for separating form sheets from a snap-out form assembly comprising interleaved form and carbon sheets, said device including a body member and adjustably positioned rotating rolls adapted to engage an end of said assembly, clamping members resiliently forced toward and from each other and engaging the form sheet edges beyond the edges of said carbon sheets opposite the head end of said assembly, and positioning means to present an end of said assembly to said rolls after said sheets are clamped, said positioning means after severing said form sheets from said carbon sheets swinging the forward ends of said form sheets to a delivery position, said carbon sheets being moved to a separate delivery position.

9. A device for separating form sheets from a snap-out assembly comprising interleaved form and carbon sheets, said device including a body member having a frame vertically adjustable thereon, clamping members on said frame movable toward each other, a pair of continuously rotating rolls on said body member normally

pressed together, guiding means for a snap-out assembly extending between said clamping members and rolls, whereby rotation of said rolls when said clamping members are closed will separate said form sheets from said carbon sheets, and means to separate said clamping members after said form sheets have been severed from said carbon sheets, said guiding means moving to an oscillated position and advancing said carbon sheets after severing to a delivery position.

10. A device for separating form sheets from a snap-out form assembly comprising interleaved form and carbon sheets, said device including a body member and adjustably positioned, continuously rotating rolls adapted to engage one end of said assembly, clamping members movable into and out of clamping position and engaging the form sheet edges beyond the edges of said carbon sheets opposite the head end of said assembly, guiding means to present the head end of said assembly to said rolls, whereby after severing said form sheets from said carbon sheets, said guiding means and rolls will advance said carbon sheets to a delivering position, the forward ends of said form sheets being moved laterally to advance said sheets to a separate delivery position.

11. A device for separating form sheets from a snap-out assembly comprising interleaved form and carbon sheets, said device including a body member and a frame vertically adjustable thereon, clamping members for one end of said assembly, cam means to move said members toward and from clamping position, a pair of continuously rotating rolls on said body member normally pressed together, abutment means to position the assembly for clamping, guiding means for a snap-out assembly extending from between said clamping members to said rolls, whereby rotation of said rolls when said clamping members are closed will separate said carbon sheets from said form sheets, and means to separate said clamping members after said form sheets have been severed from said carbon sheets and advance said form sheets to a delivery position.

12. A device for severing form sheets from an assembly of interleaved form and carbon sheets comprising a body member having a pair of continuously rotating rolls therein, clamping members, cam means to move said clamping members toward their clamping position, guiding means for said assembly between said clamping members and rolls, and a circuit closing switch actuated by movement of said assembly to a position within the device to effect closure of said clamping members with one edge of said assembly therebetween, power means to move said assembly downward while its upper edge is clamped and present the opposite end of said assembly to said rotating rolls.

BERNARD A. STAFFORD.

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