United States Patent [19]

Pfaffle

[11] **3,826,290**

[45] **July 30, 1974**

[54] **COIL BINDING MACHINE**

[75] Inventor: **Ernst Pfaffle,** Neuffen, Germany

[73] Assignee: **Hans Sickinger Company,** Pontiac, Mich.

[22] Filed: **Mar. 8, 1973**

[21] Appl. No.: **339,125**

[52] **U.S. Cl.**..... **140/92.7,** 81/907, 140/92.3, 198/33 AD

[51] **Int. Cl.** **B21f 11/00,** B21f 15/00

[58] **Field of Search** ..... 140/1, 92.3, 92.7, 92.93, 140/92.94; 81/907; 198/33 AD; 11/1 R; 214/1 Q

[56] **References Cited**

UNITED STATES PATENTS

2,692,670	10/1954	Lescallette	198/33
2,730,142	1/1956	Berberich	140/92.3
2,963,049	12/1960	Biel et al.	140/92.3
3,133,562	5/1964	Whitcomb	140/92.3
3,727,744	4/1973	Willard	198/33

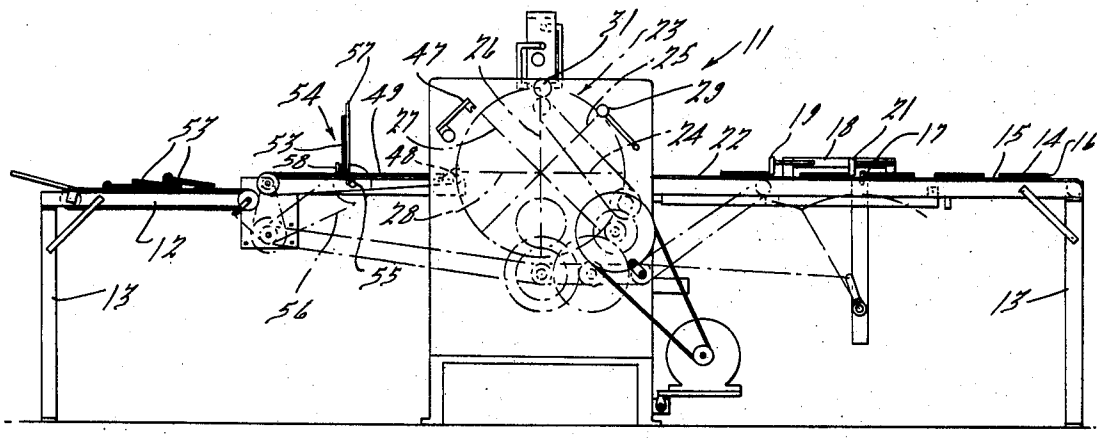
Primary Examiner—Lowell A. Larson

Attorney, Agent, or Firm—Harness, Dickey & Pierce

[57] **ABSTRACT**

Stacks of sheets are fed to a rotary carrier indexable to successive stations where the sheets are aligned and spiral bound. The binding takes place at two separate stations, the coil being inserted and severed from the feed wire at one station with an axially moving shear and the ends trimmed and turned inward at the succeeding station. After leaving the carrier, alternate books are flipped over by a continuously rotating set of fingers and stops.

6 Claims, 6 Drawing Figures



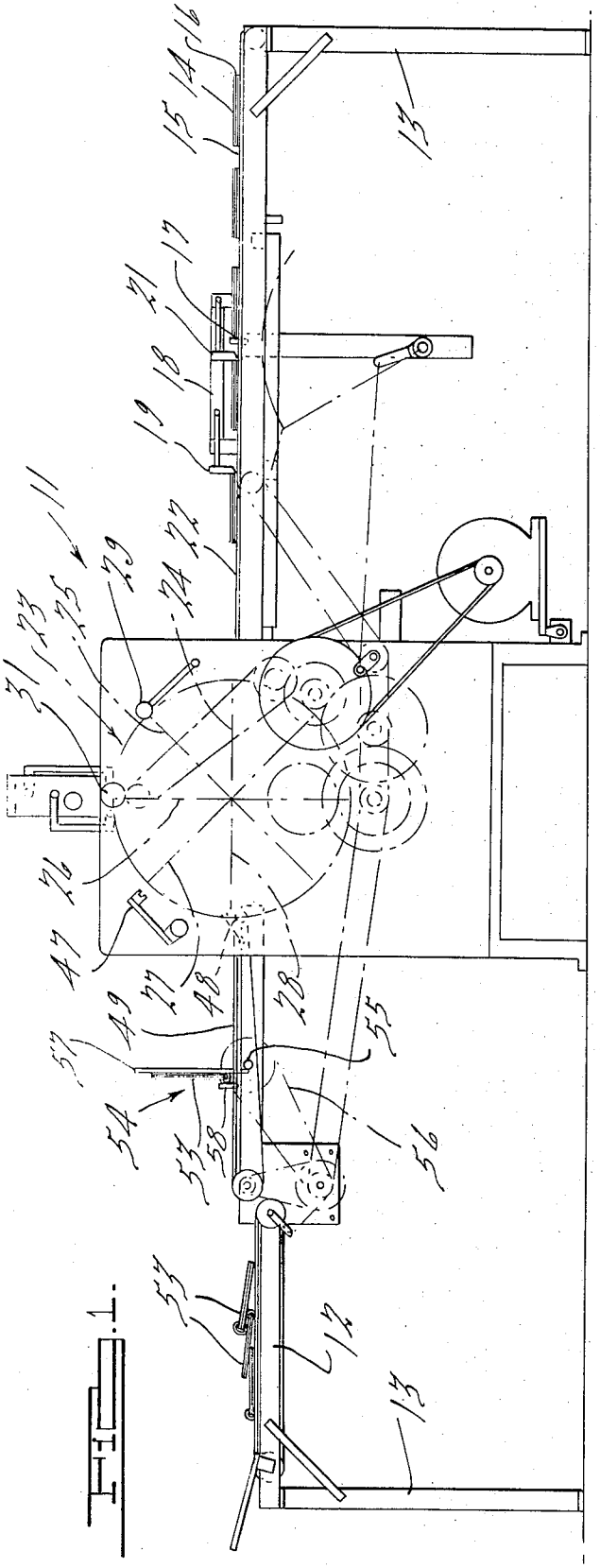


Fig. 1.

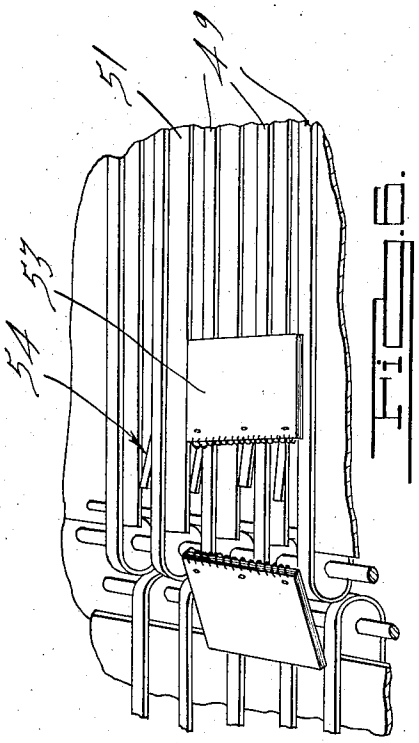


Fig. 4.

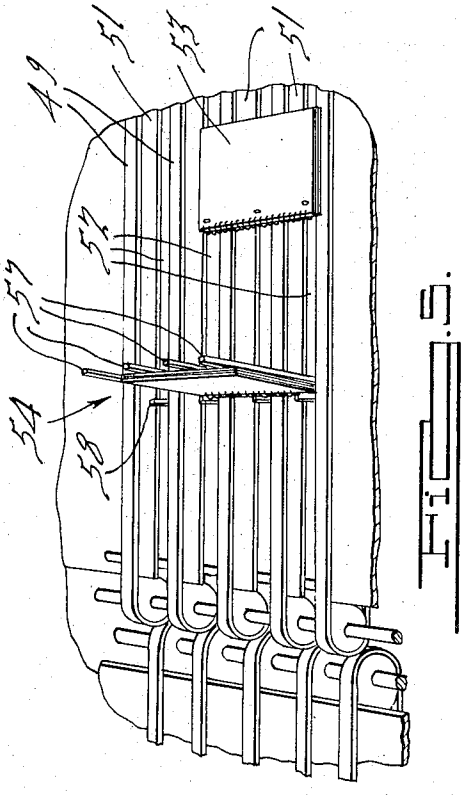


Fig. 5.

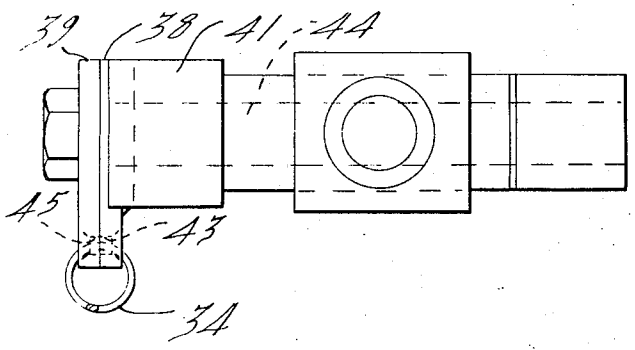


Fig. 3.

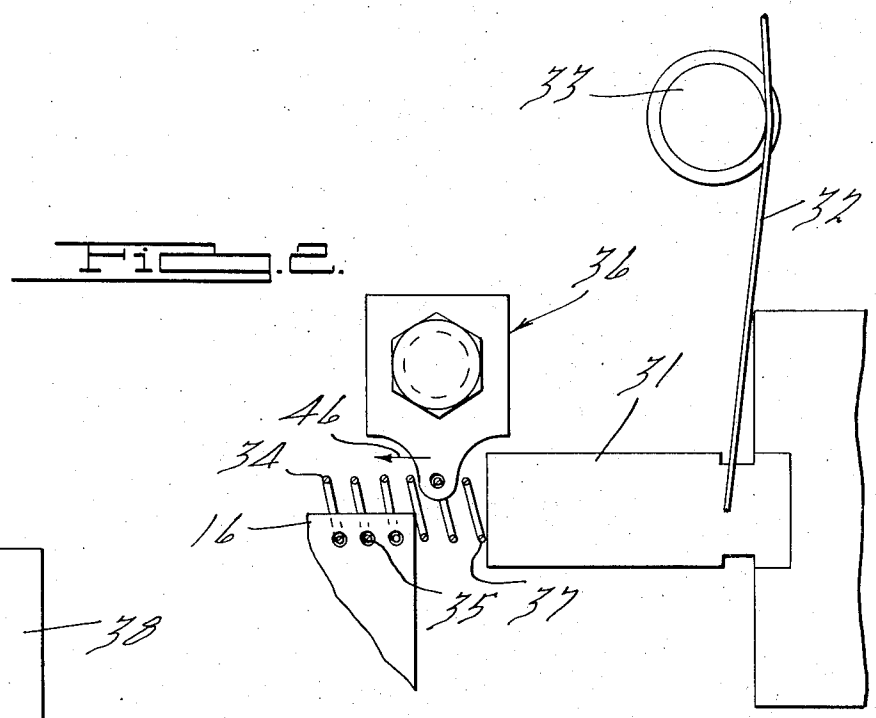


Fig. 2.

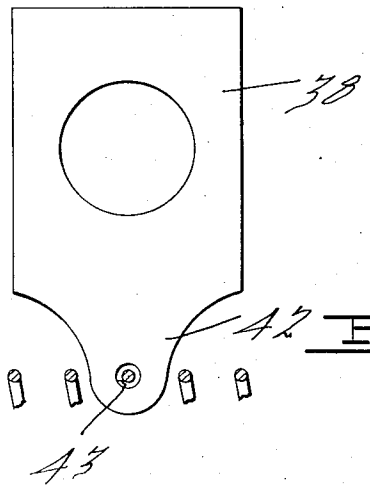


Fig. 4.

COIL BINDING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to coil binding machines used to insert spiral wire binders in the spines of books and to stack the bound books for subsequent handling.

2. Description of the Prior Art

Conventional spiral binder applying devices of this general type have rotating carriers which are indexed to successive stations. An example is Biel and Pfaffle U.S. Pat. No. 2,963,049 at which the perforated sheet pile is inserted at the first station, the sheets are aligned at the second station, the spiral binder is inserted, its ends cut and bent inward at the third station, and the book removed at the fourth station. Although constructions of this type have been generally satisfactory, difficulties may arise if the cutting and bending operation at the feed end of the coil is not properly accomplished. In such cases, the leading end of the next coil may be distorted and will not be fed cleanly through the holes of the next book, resulting in stoppage of the machine and a loss of production.

Another disadvantage of the previous arrangement is that the crowded nature of the feeding, cutting and bending station does not permit accessory devices to be used. Devices such as a positioner for wire wall hangers, or tools for looping or soldering the ends, must be part of a separate operation, thus increasing the production costs.

In order to stack the bound books evenly, it is necessary to reverse every other book delivered from the binder applying machine. Prior art reversing devices which work on a rocking principle, such as that of Sickinger et al. U.S. Pat. No. 3,485,387, are known for accomplishing this purpose. However, such devices have disadvantages in terms of manufacturing expense and wear on the parts due to the constant reciprocating motion.

BRIEF SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel and improved coil binding machine which overcomes the drawbacks of previous devices discussed above, and permits high production of spiral bound books in an efficient and reliable manner.

It is a further object to provide an improved machine of this nature which insures that the leading end of each spiral binder will not be distorted with respect to the holes which it enters, thus reducing the possibility of interruptions during operation.

It is another object to provide an improved coil binding machine of this character which permits combining other operations such as the positioning of wall hangers in the spiral binder, with such operations being performed at the binding station.

It is also an object to provide a coil binding machine having these characteristics, which incorporates novel means for reversing every other book discharged from the rotary carriage, this reversing means doing away with rockable components in favor of means which rotate continuously in the same direction, thus reducing wear and contributing to longer life of the machine.

Briefly, the illustrated embodiment of the invention comprises a rotary carriage having eight radially arranged pile holders. The carriage is indexable in 45° increments, there being five stations at which operations take place. The unbound books are received at the first horizontal station and the holes aligned at the second station. At the third station, the spiral binder is inserted and is severed from the feed wire by a shear moving in an axial direction. If desired, an additional operation such as positioning of a wire wall hanger may take place at this station. At the next station, the ends of the spiral binder are trim-cut and bent inwardly and at the fifth station the books are removed. They are carried by belts resting on ways to a reversing device. The latter comprises a continuously rotating transverse shaft immediately below the level of the ways and carrying axially extending fingers aligned with the spaces between the ways. Short radial book spine receivers extend from the shaft which is timed to rotate so that every other book will pass uninterruptedly over the reverser. The alternate books are caught by the spine receivers and lifted by the fingers so that they are flipped over and fall onto the belts which carry them away before the fingers come down to belt level.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of the invention;

FIG. **2** is an enlarged fragmentary and partially schematic side elevational view showing the relative locations of the coiling tool and the severing shears;

FIG. **3** is an end elevational view of the severing shears;

FIG. **4** is a detail side elevational view of one of the severing shears;

FIG. **5** is a fragmentary perspective view showing the reversing mechanism as it lifts a book to be reversed; and

FIG. **6** is a view similar to FIG. **5** showing the book having been reversed and the next book passing over the reversing mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The machine is generally indicated at **11** and has an elongated frame **12** on legs **13.** Sheet piles **14** are placed at the entering or right hand end of frame **12** and are fed to the left. These piles may comprise booklets which are punched along their trailing edges **16** to receive a spiral wire binder. The piles are transferred by transversely spaced belts **15** to a set of vertically reciprocable fingers **17.** The fingers rise under the trailing end **16** of each pile to stop the next pile and thereby create a space between the piles. A pusher carriage **18** is disposed adjacent fingers **17** and carries forward pushers **19** and rear pushers **21.** The rear pushers pick up each pile **14** as it passes fingers **17** and push them onto runners **22** while at the same time forward fingers **19** are advancing the next forward pile. A rotating depository or carriage generally and schematically indicated at **23** is provided in advance of pusher **18.** This carriage is intermittently rotated and equipped with radially arranged supporting plates and controlled jaws for gripping the sheet piles fed to them by pushers **19.** The indexing movement of carriage **23** carries each pile from a first horizontal receiving station **24** to an aligning station **25,** from there to a spiral binder inserting and coil severing station **26,** thence to a coil trim-cutting and bending station **27** and finally to a second horizontal station which is the exit station **28.**

Carriage 23 has eight sets of supporting plates and jaws spaced 45° apart which is equal to the indexing movement between stations. There are thus five stations at which operations take place, the three remaining stations being for return of the plates and jaws.

Station 25 has a sheet pile adjusting rake indicated schematically at 29 which aligns the holes of the loosely held sheets with the proper curvature and pitch angle for receipt of the spiral binder. At station 26 a coiling tool 31 takes the wire 32 from an idler roll 33 (FIG. 2), forms it into a spiral binder 34 and feeds the binder through holes 35 along edge 16. Unlike the conventional machine, the opposite ends of binder 34 are not trim-cut and bent inwardly at station 26. Instead, a shear generally indicated at 36 severs binder 34 from the remainder 37 of the coiled wire issuing from tool 31.

Shear 36 comprises two plates 38, 39 having the shape shown in FIG. 4. Plate 38 has a main portion which is fixed to a stationary bracket 41. The plate has a depending portion 42 with an aperture 43 which receives wire coil 34.

Plate 39 overlaps plate 38 and is fixed to a rockable shaft 44. This plate likewise has a hole 45 which is aligned with hole 43 in one position of shaft 44. Periodically, however, the shaft will be rocked so as to move plate 39 in such a manner that the coil is sheared in the contact plane of the two plates. This shearing action takes place in an axial direction, that is, in the direction of the arrow 46 of FIG. 2. The reciprocating movement of shaft 44 is very quick and the result will be a clean cut which will leave the leading end of the new coil undistorted, thus insuring that it will pass cleanly through holes 35 of the next pile.

If desired, an additional operation may be performed at the station 26. For example, a wire wall hanger positioner may be placed at that station which will place a wire wall hanger so as to be engaged and held in position by the advancing spiral wire binder. The placement of such devices and their attendant mechanism will be possible because the mechanism for trim-cutting and inwardly bending both ends of the spiral binder are not located at station 26.

Instead, the trimming and bending of the ends of spiral binder 34 will take place at station 27 by means of a mechanism indicated partially and schematically at 47. This mechanism need not be described in detail since it is known in itself. If desired, additional mechanism such as tools for looping the ends of the binder around adjacent coils, and soldering such locked coils, may be provided at station 27. After leaving station 27, the booklets will reach station 28 where they will be released from the carriage 25 and advanced by rollers 48 onto belts 49.

These belts rest on bed plates 51 which are transversely spaced, the spaces between the plates being indicated at 52. The bound books 53 advance along bed plates 51 toward a reversing mechanism generally indicated at 54. This mechanism comprises a shaft 55 extending transversely beneath plates 51 and rotated continuously in the same direction by a drive belt 56, this direction being counterclockwise in FIG. 1. A plurality of fingers 57 are secured to shaft 55 and extend radially outwardly therefrom, these fingers being aligned with the spaces 52 between plates 51. Shaft 55 also has a plurality of hook-shaped members 58 which are relatively short and extend outwardly at right angles to fingers 57, the outer ends of these hooks extending a short distance in the same direction as fingers 57.

In operation, the relative timing of belts 49 and reversing mechanism 54 is such that every other book 53 will pass over the reversing mechanism while it is beneath the level of plates 51, as seen in FIG. 6. However, the next book 53 will arrive over fingers 57 just as they begin to ascend above the level of plates 51 on the right hand side of shaft 55. Spiral binder 34 of this book will engage hooks 58 which extend above the level of the plates. The book will be lifted and flipped over as seen in FIG. 5, landing on belts 49. The speed of the belts is such that the flipped-over book will be carried away from reversing mechanism 54 before fingers 57 thereof come down to the level of plates 51, so that the book does not interfere with the continuous rotation of the reversing mechanism. The books will thus be delivered to belts 59 with alternate orientation.

I claim:

1. In a coil binding machine, a rotary carriage having radially disposed and equidistantly spaced perforated sheet pile holding means, the carriage being indexable in increments so that each sheet pile is brought successively to five stations, means at the first station for feeding the unbound piles perforated along their trailing edges onto the holding means, whereby the perforations are at the outside of the carriage, means at the second station radially outwardly of the sheet piles for aligning the perforations, a coiling tool at the third station radially outwardly of the sheet piles for forming and feeding the spiral wire binder into the perforations, shearing means at said third station for severing said binder in a manner such that the leading end of the next binder is undistorted and will pass freely through the perforations of the next pile, means at the fourth station for trim-cutting and inwardly bending the opposite ends of the binder, and means at the fifth station for removing the bound piles from the carriage.

2. The combination according to claim 1, said shearing means having a portion which is movable in the general direction of the coil axis.

3. The combination according to claim 2, said shearing means comprising a pair of plates, one being fixed and the other movable, a pair of holes in said plates through which the coil passes, and means for rocking the movable plate to perform the shearing action.

4. The combination according to claim 1, further provided with belts for transporting the bound books along bed plates, and means for inverting alternate books comprising a rotary shaft beneath said bed plates, fingers extending radially from said shaft and aligned with spaces between said bed plates, relatively short hooks substantially perpendicular to said fingers and extending above the bed plates when the fingers are substantially horizontal, and means for continuously rotating said shaft in a manner which is synchronized with said belts whereby each alternate book will be stopped by said hooks and inverted by the fingers, said belts transporting said inverted books out of the vicinity of said fingers before they again reach the level of said plates, the books not inverted being carried by said belts past said inverting mechanism while the latter is below the level of said plates.

5. A mechanism for transporting spiral bound books or the like to a delivery point and inverting alternate books so that they will stack evenly, comprising a plurality of transversely spaced bed plates, a plurality of

endless belts having their upper runs resting on said bed plates, a shaft extending transversely below said bed plates, means for continuously rotating said shaft, a plurality of fingers extending radially from said shaft and aligned with the spaces between said plates, a plurality of relatively short hooks on said shaft and aligned with but extending substantially perpendicular to said fingers, said hooks being of such size that they are disposed above said belts when the fingers are horizontal in one position, the driving means for said belts and inverting mechanism being so synchronized that the hooks of the inverting mechanism will periodically stop movement of a book being transported by said belts and said fingers will rise from said spaces and flip said book over onto said belt, the speed of the latter being such that the inverted book will be withdrawn from the vicinity of said fingers before the fingers descend through said spaces.

6. In combination, a coiling tool for forming and feeding a spiral wire binder into a row of sheet pile perforations, and shearing means for severing said binder in a manner such that the leading end of the next binder is undistorted and will pass freely through the perforations of the next pile, said shearing means comprising a pair of plates, one being fixed and the other movable, a pair of holes in said plates through which the coil passes, and means for rocking the movable plate to perform the shearing action.

* * * * *