

Sept. 30, 1958

M. B. HALL ET AL  
BOX STRAPPING APPARATUS

2,853,938

Filed June 24, 1955

4 Sheets-Sheet 1

Fig. 1.

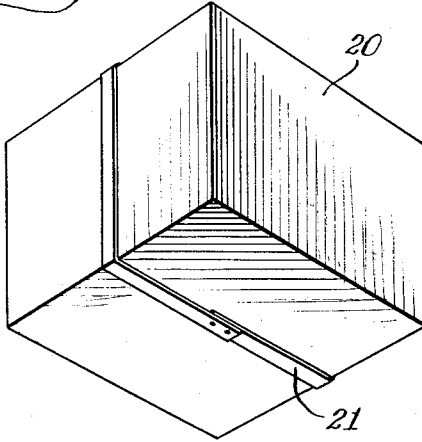


Fig. 2.



Fig. 3.

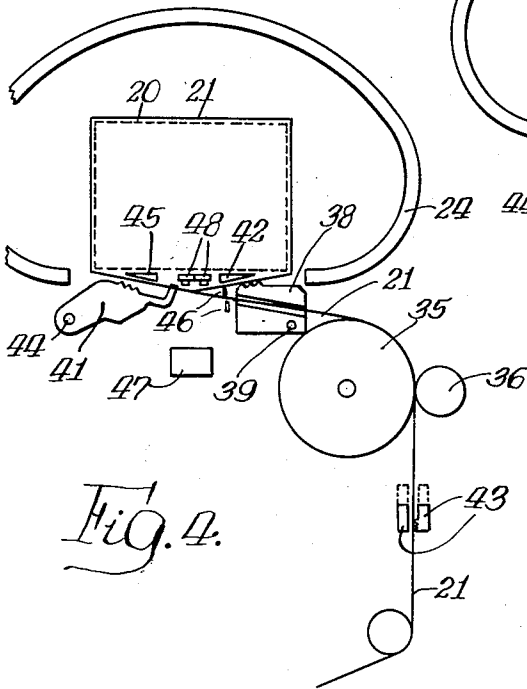
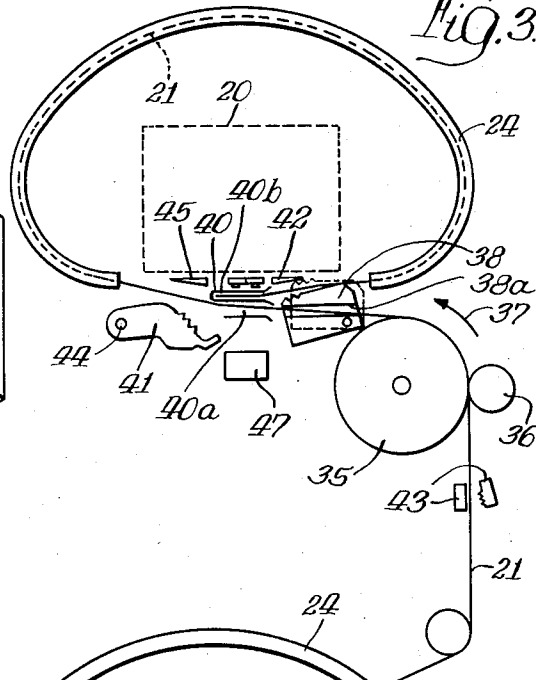


Fig. 5.

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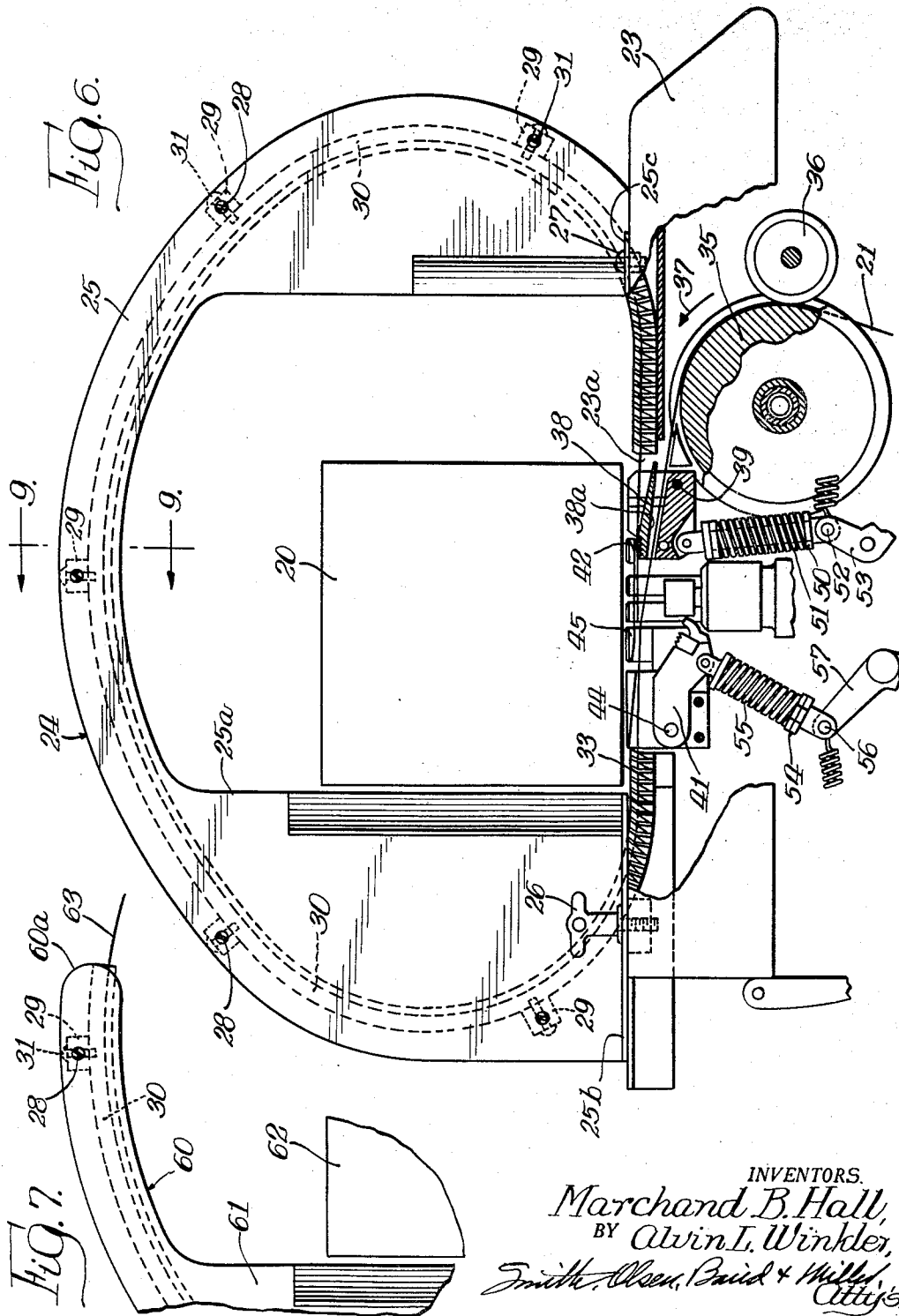
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## BOX STRAPPING APPARATUS

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Fig. 8. Fig. 9. Fig. 10.

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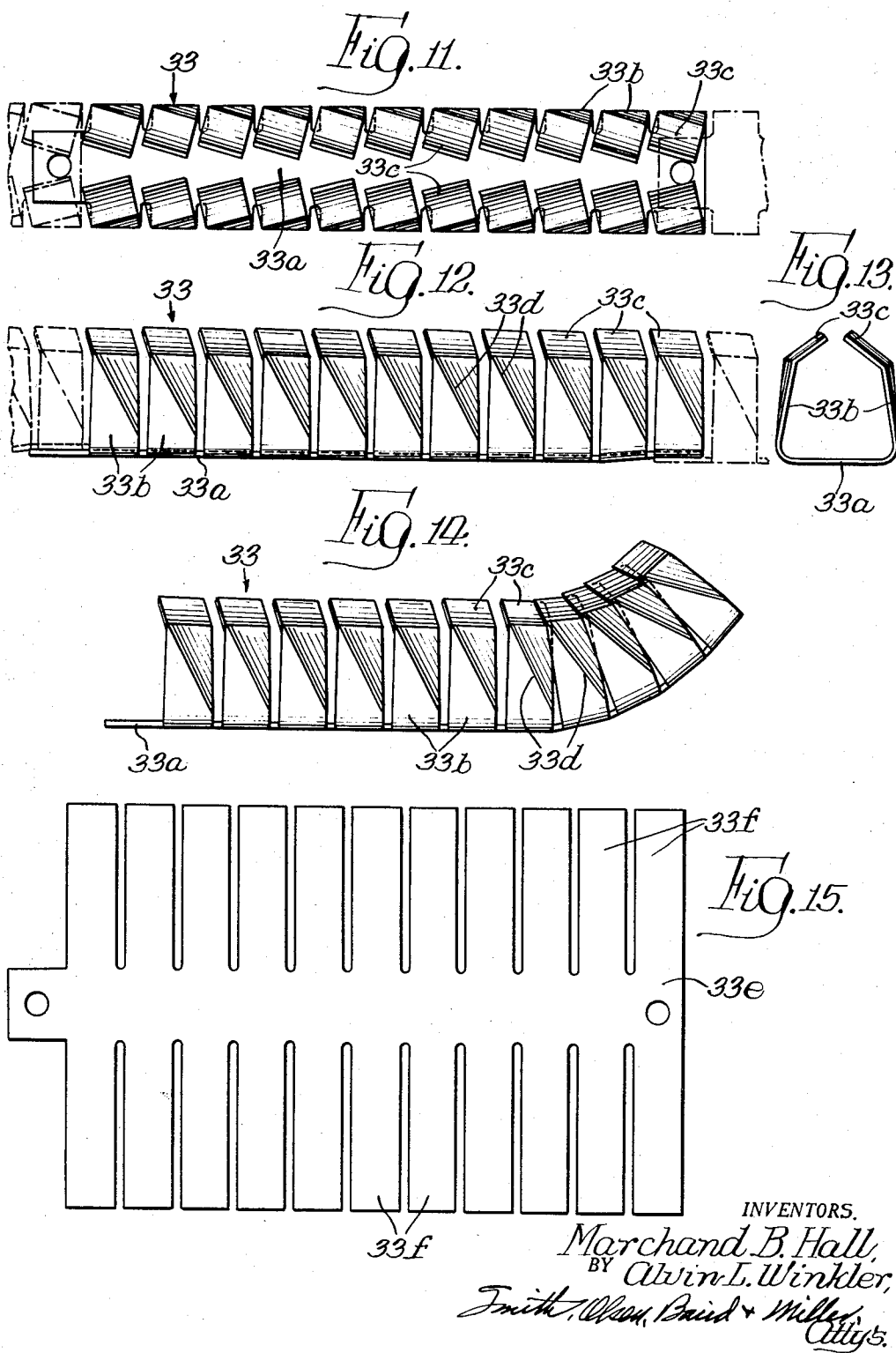
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2,853,938

## BOX STRAPPING APPARATUS

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Application June 24, 1955, Serial No. 517,768

4 Claims. (Cl. 100—26)

This invention relates to improvements in box strap-  
ping apparatus and its purpose is to provide a novel de-  
vice by which a binding strap is guided about a box or  
other object to be bound preliminary to drawing the  
strap taut around the object and then securing its ends  
together.

In the binding of boxes, packages and the like, it is  
common practice to encircle the box with a binding strap  
by a manual operation without the use of any guiding  
means. This method is rather slow and it is particularly  
unsatisfactory when large boxes or packages are being  
bound since it is then extremely difficult for a single op-  
erator to cause the strap to form a loop encircling the  
package. In many binding operations, it has been  
necessary to use a second operator stationed behind the  
package to assist in directing the free end of the strap  
over the package to the first operator who has passed the  
strap rearwardly beneath the package. The problem is  
much the same whether the strap is finally drawn taut  
and its ends secured together by a manual operation or  
by the use of a power driven machine.

It is, therefore, the principal object of the present in-  
vention to provide improved apparatus by which the  
binding strap is guided about the package during the  
binding operation which may be performed manually  
or by a power driven machine. A further object of the  
invention is to provide a novel device by which a binding  
strap, fed thereto manually or by power operated means,  
is caused to encircle the package either partially or  
wholly. Another object of the invention is to provide  
apparatus comprising a guide or track adapted to direct  
a binding strap to form a loop around a package and  
then to release the strap when it is drawn taut to cause  
the loop to contract and tightly engage the package.  
Still another object of the invention is to provide strap  
guiding means adapted to extend partially or wholly  
about a package and comprising resilient members  
adapted to retain the strap while it is being fed through  
said guiding means to encircle the package and to re-  
lease the strap automatically when the loop of strap is  
then drawn taut to engage the package. Other objects  
relate to various features of construction and arrange-  
ment which will appear more fully hereinafter.

The nature of the invention will be understood from  
the following specification taken with the accompanying  
drawings in which one embodiment of the invention and  
a modification thereof are illustrated. In the drawings,

Figure 1 shows a perspective view of a box which has  
been reinforced by a surrounding binding strap with the  
use of the apparatus of the present invention;

Fig. 2 shows an enlarged plan view of the welded joint  
by which the ends of the binding strap shown in Fig. 1  
are united;

Fig. 3 shows a somewhat diagrammatic vertical cross  
section taken through a machine embodying the present  
invention illustrating the means for guiding the strap  
when it is caused to encircle the box and illustrating the  
relative positions of the parts at the conclusion of the box  
encircling operation;

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Fig. 4 shows a view similar to that of Fig. 3 at a later  
stage of the operation when the strap has been withdrawn  
from the guiding means and contracted about the box;

Fig. 5 is a view similar to those of Figs. 3 and 4  
illustrating the relative positions of the parts when the  
box encircling portion of the strap has been cut off from  
the supply and a joint has been formed between the over-  
lapping ends of that portion of the strap;

Fig. 6 shows an enlarged end elevation of and partial  
transverse vertical section through the upper portion of  
the machine which is illustrated diagrammatically in Figs.  
3, 4 and 5;

Fig. 7 is a partial end elevation similar to that of  
Fig. 6 showing a modified form of the present invention  
which is adapted to be used when the operation of ex-  
tending the binding strap around the box is performed  
manually;

Fig. 8 shows a top plan view of the apparatus il-  
lustrated in Fig. 6;

Fig. 9 shows an enlarged vertical section taken on the  
line 9—9 of Fig. 6;

Fig. 10 shows a partial bottom plan view of the guide  
channel or track which is embodied in the apparatus  
shown in Fig. 6 for guiding the strap around the box, a  
portion of the strap retaining means being shown in  
section;

Fig. 11 shows a bottom plan view of the strap retaining  
means embodied in the guide channel shown in Fig. 10  
when removed from the other parts of the structure;

Fig. 12 shows a side elevation of the strap retaining  
means shown in Fig. 11;

Fig. 13 shows an end elevation of the strap retaining  
means shown in Fig. 12;

Fig. 14 shows a side elevation of the strap retaining  
means shown in Figs. 11 and 12 when it is partially bent  
to pass around a curved portion of the guide channel;  
and

Fig. 15 shows a plan view of the sheet metal blank  
from which the strap retaining means shown in Figs.  
11 and 12 is formed.

The apparatus of the present invention is adapted for  
use in guiding a metal strap around a box, package or  
other object which is to be reinforced and in Fig. 1  
there is shown a perspective view of a box 20 surrounded  
by a metal strap 21 which is drawn taut around the box  
and which has its overlapping ends joined together by  
means of spot welds 22 as shown particularly in Fig. 2.  
Other means for joining the ends of the strap may be  
employed if desired.

In Figs. 3, 4, 5, 6 and 8 to 15, inclusive, of the draw-  
ings, the invention is illustrated as being embodied in  
a machine which is power operated for the purpose of  
feeding the strap around the box and drawing it taut.  
Referring to Fig. 6, it will be seen that this invention  
comprises a table 23 upon which there is mounted a  
guide channel or track 24 having a substantially ellipti-  
cal form and comprising a pair of parallel side plates 25  
which are spaced apart and provided with openings 25a  
having a general rectangular form to receive the box  
20. At the rear of the machine, the side plates 25 are  
provided at their lower extremities with outwardly ex-  
tending horizontal flanges 25b which are secured to the  
top of the table 23 by screws 26 and, at the forward side  
of the machine, these side plates 25 are provided with  
other laterally extending horizontal flanges 25c which are  
secured to the table top by screws 27. The table top is  
provided with an opening 23a above which the box 20  
is adapted to be mounted for binding purposes and, in  
this opening, there is mounted the mechanism by which  
the strap is fed through the guide channel 24 and there-  
after drawn taut, its supply portion cut off, and its ends  
joined by spot welding or the like.

As shown particularly in Figs. 8, 9 and 10, the side

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plates 25 of the guide channel are secured by studs 28 to a series of blocks 29 which are spaced apart about the guide channel and which serve not only to connect the side plates 25 but also to support a bar 30 of rectangular cross section which is bent into a substantially elliptic form to correspond to the general contour of the guide channel. This bar 30 is secured to the blocks 29 by a series of bolts or studs 31 and the bar serves as the bottom wall of the channel in which the metal strap 21 is adapted to travel. The metal strap is normally retained in its position adjacent the bar 30 by means of a channel-shaped retaining member 33 which has a back wall 33a clamped between the bar 30 and the blocks 29 and secured to the bar by a series of screws 34.

The retaining member 33 is provided on opposite sides with inwardly extending resilient tongues 33b which terminate in inwardly inclined downwardly converging portions 33c. The tongues 33b are bent slightly along diagonal lines 33d so that adjacent tongues are relatively inclined and are thus permitted to overlap when the retaining member is bent into curved form as shown particularly in Fig. 14. The bends along diagonal lines 33d also provide a modified funnel arrangement to prevent the strap leading end from snagging on the tongues 33b as it is fed through the guide track. The strap movement must be in the direction of the arrow as shown in Fig. 10 to prevent the movement of the strap from being snagged by the tongues 33b. The retaining members 33 may be formed from a blank of thin sheet metal 33e, shown in Fig. 15, which is slotted transversely to form a plurality of parallel arms 33f adapted to be bent into the form of the tongues 33b. The extremities 33c of the tongues overlap the strap 21 when the strap is in position in the guide channel but when the strap is contracted to move into engagement with the box 20, the tongues are adapted to spring outwardly to the positions shown by dotted lines in Fig. 9 so that the strap 21 may move inwardly to the position shown by dotted lines. The guide channel or track 24 is adapted to extend completely around the position to be occupied by the box 20 and its extremities terminate in proximity to the margins of the opening 23a in the table over which the box 20 is adapted to be located preliminary to the application of the binding strap.

The binding strap 21 is adapted to be drawn from a source of supply, not shown, by a power driven feed roll 35 and it is held in contact with that feed roll by an idler roll 36. As the roll 35 rotates in the direction of the arrow 37, the strap 21 is projected through the guide passage 38a of the forward gripping dog 38 which is pivoted at 39 on the frame of the machine beneath the table. The strap then extends through a passage 40a (see Fig. 3) of a guide member 40 which is located beneath the middle portion of the box 20 and it then passes above the rear gripping dog 41 and enters the guide channel of the guideway or track 24. As the rotation of the feed roll 35 continues, the strap 21 is pushed around the guideway 24 in contact with the inner face of the bar 30 until it emerges from the guide channel 24 and passes above the forward gripping dog 38 after which it enters a socket 40b of the guide member 40, the movement of the strap being terminated by the engagement thereof with the end wall of this socket. The conditions are then substantially as shown in Fig. 3 with the binding strap 21 retained by the guide or track 24.

At this point, the forward gripping dog 38 is moved upwardly to grip the free end of the strap against a stationary gripping plate 42 so that this end of the strap is then held in stationary position. The feed wheel 35 is then reversed in its direction of rotation so that the loop of strap extending around the box 20 is contracted and the strap moves inwardly as permitted by the flexible tongues 33b of the retaining member 33. This movement continues until the strap is in close contact with

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the surfaces of the box 20. When all of the slack has been taken out of the loop of strap by the reverse operation of the feed roll 35, a pair of gripping dogs 43 are caused to grip the strap beneath the roll 35 and to be moved bodily downward to tighten the strap further until a predetermined condition of tautness has been brought about. When this condition is reached, the rear gripping dog 41 is moved upwardly about its pivot 44 until the supply portion of the strap is gripped against a stationary gripping plate 45. A pair of shearing blades 46 are then operated to sever the supply portion of the strap adjacent to the inner end of the forward gripping dog 38, thus leaving the portion of the strap which encircles the box with two overlapping ends. These ends are then secured together by the spot welds 22 which are effected by the movement of an electrically actuated welding head 47 upwardly from the position shown in Fig. 4, to the position shown in Fig. 5 where it presses the overlapping strap ends against the welding points 22, thereby welding the strap ends together at the spaced points 22. When the welding operation has been completed the welding head 47 is retracted and the other parts are restored to their initial positions in readiness for a new binding operation. Due to the use of a large number of retaining fingers 33b which are closely spaced, very thin metal may be used for these fingers and the strap is progressively released as it is tightened.

The forward gripping dog 38 is adapted to be actuated by a link 50 having a coil spring 51 connected therein and having its lower extremity connected at 52 to a bell crank lever 53. Similarly, the rear gripping dog 41 is actuated by a link 54 having a coil spring 55 connected therein and having its lower extremity connected at 56 to a bell crank lever 57. The feed roll 35 and the bell crank levers 53 and 57, as well as the welding head 47, are adapted to be actuated by a suitable mechanism, including rotary cams so that the successive movements of these parts take place in the proper timed relation as the binding of the box proceeds. A box strapping machine of this type is described and claimed in the co-pending application of Albert L. Winkler, Robert E. Hager and Kjell A. Falck-Pedersen, Serial No. 284,634, filed April 26, 1952.

While the apparatus of the present invention including the strap guiding channel or track may be employed with particular advantage in power operated machines, particularly those adapted for the binding of large boxes or the like, it may also be employed in binding operations which are carried on manually and, in Fig. 7, there is shown a modified form of apparatus which may be used for this purpose. As there shown, the machine comprises a guide channel 60 having side plates 61 which are secured to the table in the manner previously described and this guide channel extends forwardly over the position to be occupied by the box 62 to be bound. This guide channel terminates, however, short of the forward edge of the table so that it is possible to insert the box 62 from the forward side of the table and the strap 63 is thrust upwardly through the guide channel from a position beneath the box 62 until it emerges from the extremity 60a of the guide channel, whereupon this free extremity is seized by the operator and the strap is then pulled through the guide channel and passed around the box until the ends of the strap overlap. The strap may then be released manually from the fingers 33b of the guide channel and then drawn taut around the box by the use of the usual strap stretching tools. When the strap has been drawn taut its ends may be secured together by a strap sealing device or other means adapted to form an interlocking connection between the strap ends or other suitable form of joint. If desired, the complete annular guide shown in Fig. 6 could be used with a manual strapping operation.

Although one form of the invention and a modification of a portion thereof have been shown and described

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by way of illustration, it will be understood that it may be constructed in various other embodiments which come within the scope of the appended claims.

We claim:

1. The combination in box strapping apparatus, of means for supporting a box, and an arcuate guide channel through which a strap may be fed endwise around said box, said guide channel having strap retaining means comprising resilient fingers extending radially inwardly past the opposite edges of the strap and terminating in parts overlapping said strap on its inner side.

2. The combination in box strapping apparatus, of means for supporting a box, an arcuate guide channel through which a strap may be fed endwise around said box, said guide channel having strap retaining means comprising resilient fingers extending radially inwardly past the opposite edges of the strap and terminating in parts overlapping said strap on its inner side, and means for contracting said strap into engagement with said box, said fingers being adapted to release said strap when it is contracted.

3. The combination in box strapping apparatus, of means for supporting a box, and a curved guide channel extending substantially around said box for receiving a strap fed endwise therethrough, said guide channel comprising resilient fingers extending radially inwardly past

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the opposite edges of said strap and terminating in flanges overlapping said strap on its inner side, said fingers being bent diagonally between their ends whereby said flanges of adjacent fingers overlap each other.

4. The combination in box strapping apparatus, of means for supporting a box, and a curved guide channel extending around at least a part of the box for receiving a strap fed endwise therethrough, said guide channel comprising resilient fingers on opposite sides of the channel extending inwardly past the opposite edges of the strap and terminating in flanges overlapping said strap on its inner side, each of said flanges being disposed at an angle with respect to the longitudinal direction of the movement of said strap so as to prevent the leading end of said strap from catching on the edges of said flanges when said strap is fed through said guide channel.

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