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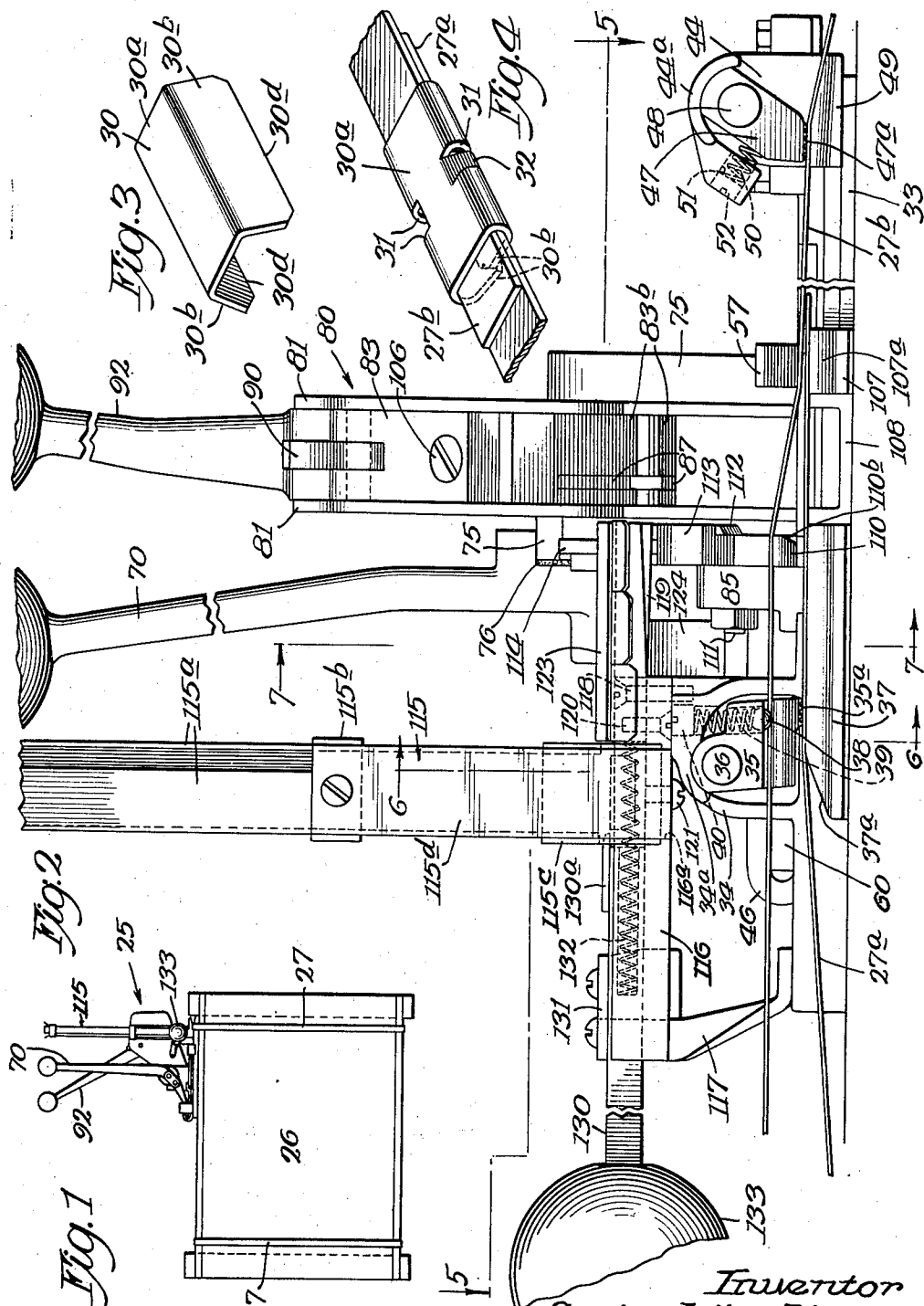
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2,097,980

STRAP SEALING APPARATUS

Filed Nov. 20, 1933

4 Sheets-Sheet 1



Inventor
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By Rector, Hibber, Davis & Macauley, Attys.

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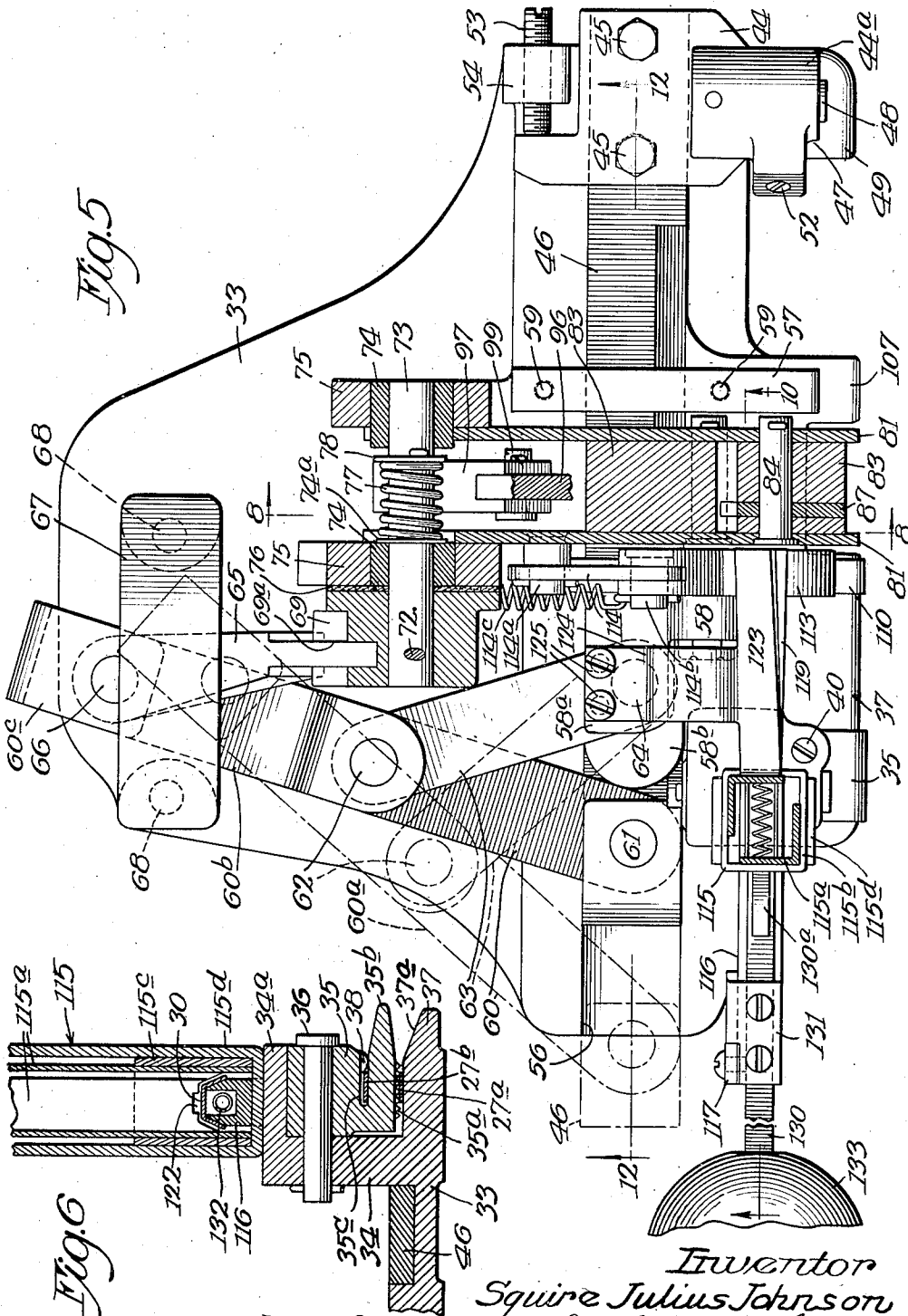
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4 Sheets-Sheet 2



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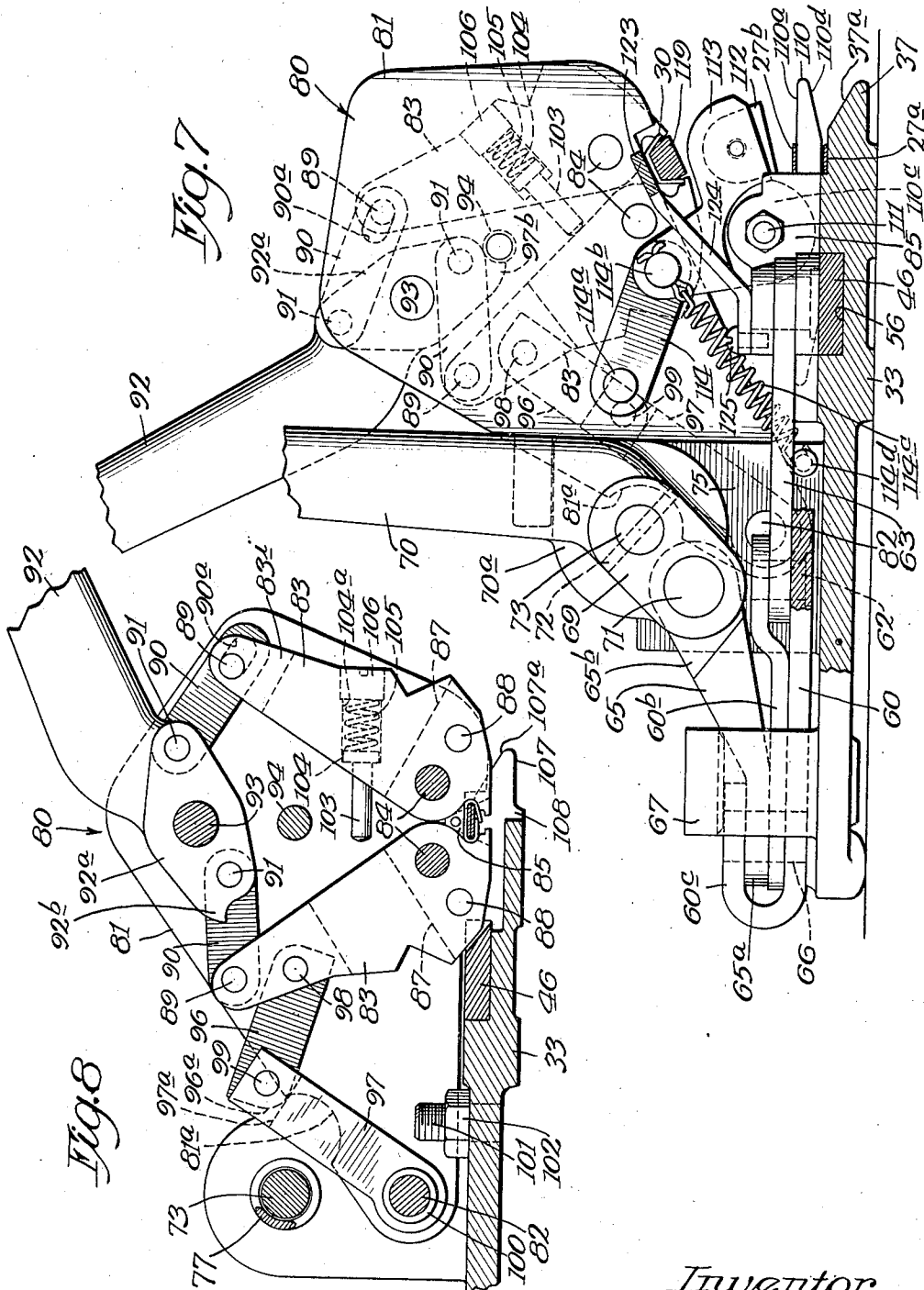
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STRAP SEALING APPARATUS

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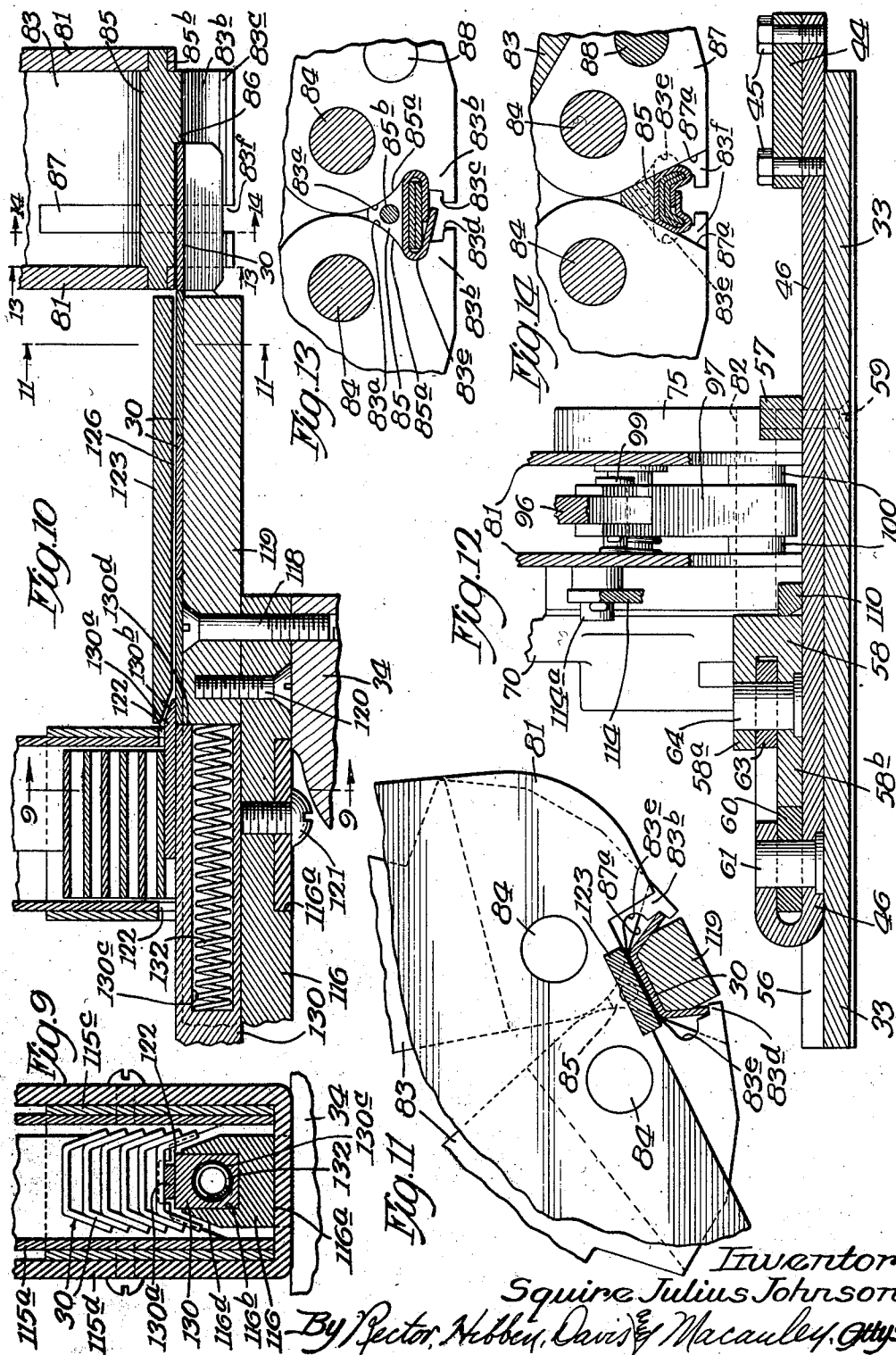
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STRAP SEALING APPARATUS

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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,097,980

STRAP SEALING APPARATUS

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Application November 20, 1933, Serial No. 698,835

14 Claims. (Cl. 81—9.1)

This invention relates to strap sealing apparatus for supplying seals to the overlapping ends of metal straps and the like such as are employed in reenforcing boxes and packages and in binding groups of boxes or other load units together. The present invention is an improvement upon that described and claimed in the co-pending application of William C. Childress Serial No. 629,798, filed August 22, 1932, in which there is disclosed a form of apparatus comprising a movable head having a pair of relatively movable jaws adapted to receive between them an open channel-shaped seal which is then brought into engagement with the overlapping ends of a metal strap by movement of the head, preliminary to the actuation of the jaws to bend the walls of the seal around the strap and then shear the edges of the strap and seal to form an interlocking joint. In the use of the apparatus disclosed in said application, the open channel-shaped seals are adapted to be inserted between the jaws by the fingers of the user, who keeps a supply of seals in the region where the work is being carried on, and the principal object of the present invention is to overcome the necessity of thus manually placing the seals between the jaws by providing an improved form of apparatus in which mechanism is provided for inserting the seals between the jaws, the seals being preferably supplied from a magazine or other source of supply which forms a part of the apparatus. A further object of the invention is to provide a strap sealing apparatus comprising means for drawing a strap taut with its ends overlapping in combination with sealing devices for applying a seal to the overlapping strap ends and forming an interlocking joint and means for feeding a seal from a source of supply to a position embracing the overlapping strap ends preliminary to the operation of the sealing devices. Still another object of the invention is to provide a strap sealing device comprising a pair of relatively movable jaws adapted to receive a seal to be held by the jaws while being supplied to the overlapping strap ends to form an interlocking joint, in combination with means for feeding seals in succession from a source of supply to a position where they are held between the jaws. Another object of the invention is to provide strap sealing apparatus comprising a pair of jaws adapted to receive and hold a channel-shaped seal between them while said jaws are moved bodily to bring the seal into engagement with overlapping strap ends, in combination with a seal-containing magazine and seal feeding means

adapted to move the seals endwise from the magazine to a position between the jaws. Other objects relate to various features of construction and arrangement 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 is illustrated. In the drawings,

Fig. 1 shows a side elevation of a box or package with the improved sealing apparatus of the present invention in position thereon for drawing a strap taut around a package and supplying a seal to the overlapping ends of a strap;

Fig. 2 shows an enlarged front elevation of the sealing apparatus shown in Fig. 1;

Fig. 3 is a perspective view of the open channel-shaped seal which is fed from the magazine of the apparatus illustrated in Fig. 2 to the sealing jaws of said apparatus and subsequently bent around the strap ends and deformed to form the interlocking joint shown in Fig. 4;

Fig. 4 is a perspective view of the completed strap joint which is formed by the operation of the apparatus illustrated in Fig. 2 upon a seal of the form shown in Fig. 3 after the seal has been applied to the overlapping strap ends;

Fig. 5 shows a horizontal section through the apparatus taken on the line 5—5 of Fig. 2;

Fig. 6 shows a detail vertical section taken on the line 6—6 of Fig. 2;

Fig. 7 shows a detail vertical section taken on line 7—7 of Fig. 2 with the movable head in its elevated position;

Fig. 8 is a vertical section taken on the line 8—8 of Fig. 5 with the movable head in its lower position;

Fig. 9 shows an enlarged detail vertical section through the seal supply magazine, the section being taken on the line 9—9 of Fig. 10;

Fig. 10 shows an enlarged vertical section taken on the line 10—10 of Fig. 5, illustrating the means for moving the seal from the seal supply magazine to a position between the jaws;

Fig. 11 shows a vertical section taken on the line 11—11 of Fig. 10;

Fig. 12 shows a vertical section taken on the line 12—12 of Fig. 5;

Fig. 13 shows an enlarged vertical section through the lower portions of the jaws taken on the line 13—13 of Fig. 10, showing the relative positions of the jaws at the point where the walls of the seal have been bent around the overlapping strap ends; and

Fig. 14 is a sectional view somewhat similar to

that of Fig. 13, but taken on the line 14—14 of Fig. 10, showing the relative positions of the jaws at a later stage of the operation when the edges of the strap and seal have been sheared to form an interlocking joint.

As illustrated in Fig. 1, the improved strap sealing apparatus 25, embodying the features of the present invention, is illustrated in position on top of a box 26 which has applied thereto a pair of steel binding straps 27 which surround the box and which have their overlapping ends united by the use of the apparatus 25, shown in operative position with respect to one of the straps. The ends of each strap 27 are adapted to be engaged by gripping devices embodied in the tool 25 which is operated to draw the strap taut around the box. When the strap has thus been drawn taut, the apparatus is operated to cut off the strap from the source of supply and to place over the overlapping strap ends a channel-shaped metal seal which is fed to the sealing devices from a magazine in which a number of seals are stored. The sealing devices are carried by a movable head and when a seal has been inserted between these devices, the head is moved downwardly to effect the cutting off of the strap and place the seal in a position where it embraces the strap ends, whereupon the sealing devices are operated to bend the walls of the seal about the strap and then to shear the edges of the strap and seal to form an interlocking joint of the type described and claimed in the United States Patent No. 1,260,016, dated March 19, 1918, one form of which is shown in Fig. 4 of the drawings. The apparatus of the present invention is particularly adapted to be employed with an improved form of seal 30, shown in Fig. 3, which is described and claimed in the co-pending applications of Chester M. MacChesney Serial No. 629,918, filed August 22, 1932, Serial No. 727,410, filed May 25, 1934, now issued as Patent Number 1,988,742, dated Jan. 22, 1935 and Patent Number 2,062,098, dated Nov. 24, 1936, respectively.

This seal is in the form of a channel-shaped metal member having a back wall 30^a and side walls 30^b which diverge from the back wall to their outer edges. This flared arrangement of the side walls of the seal permits it to be applied readily to the overlapping ends of the strap, facilitates the holding of the seal in the sealing apparatus during the operation of applying it to the overlapping strap ends and permits a plurality of similar seals to be stacked in nested relationship with each other so that they may be formed into a bundle for insertion in the magazine of the sealing apparatus. The contacting side walls of adjacent seals in the stack are preferably secured together by a suitable cement, such as ethyl acetate, so that the stack may be conveniently placed as a unit in the seal magazine of the apparatus, while permitting successive seals to be readily broken off from the stack thereafter and moved to a position between the jaws of the movable head. Each seal 30 is formed of metal which is hard and stiff but which has a slight resiliency and sufficient ductility to cause it to retain a permanent set after the walls 30^b have been bent around the overlapping ends of the strap.

After the ends 27^a and 27^b of the strap have been overlapped and while the strap is held taut by the stretching device, the upper end portion 27^b of the strap is cut off from the source of supply and the movable head of the apparatus is operated to position a seal 30 over the overlapping

ends of the strap, after which the relatively movable jaws or sealing devices of the head are operated to bend the side walls 30^b inwardly beneath the strap ends into positions where they lie substantially parallel to the top or back wall 30^a of the seal and preferably overlapping each other slightly, as shown in Fig. 4. The relatively movable jaws or sealing devices carried by the head are then operated to cause the cutting dies thereof to engage the lateral edges of the strap and seal to shear them along transverse lines 31 and at the same time to deflect the metal of the strap and seal at one side of the line of shear in order to form an interlocking joint. At least one pair of cuts 31 is preferably formed along each edge of the seal and the metal between the pair of cuts is deflected downwardly by the cutting dies to form angularly disposed tongues or projections 32, as shown in Fig. 4. The edges of these tongues or projections cross the body portions of the strap and seal, thus forming interlocking joints at a plurality of points. In the form of joint shown in Fig. 4, there are two pairs of cuts on each side of the seal.

The sealing apparatus 25 comprises a base plate 33 which is adapted to rest upon the surface of the box or package about which a strap 27 is to be drawn taut and sealed. This plate 33 preferably has the irregular contour shown in Fig. 5 and the forward portion thereof is provided with two pairs of relatively movable gripping devices which are adapted to grip the opposite end portions of the strap and to hold them while the strap is being drawn taut. One pair of gripping devices is carried directly by the base plate and for this purpose the forward portion of the plate 33 is provided with an upwardly extending integral block or base 34 having an overhanging flange 34^a adapted to conform to and contact with the curved upper end of a movable gripping dog 35 which is pivotally mounted upon a pin 36 engaging the back wall of this boss, as shown particularly in Fig. 6. This gripping dog is provided on its under side with a serrated gripping surface 35^a which is adapted to coact with the upper side of the end portion 27^a of the strap 27 when this strap is seated upon the stationary gripping plate or flange 37 which projects forwardly as an integral part of the base plate 33. This gripping plate or flange has its outer edges beveled downwardly as shown at 37^a to facilitate the insertion of the strap beneath the movable gripping dog 35 which is similarly provided with a tapered portion 35^b adapted to cooperate with the beveled surface 37^a to form a tapered passage to receive the strap, as shown in Fig. 6. The serrated surface 35^a of the gripping dog 35 is offset toward the right, as viewed in Fig. 2, with respect to a vertical plane passing through the axis of the pivot pin 36, so that when the end 27^a of the strap is inserted beneath it, a pull on the strap toward the left, as viewed in Fig. 2, will tend automatically to increase the grip of the dog 35 upon the strap. When a pull is exerted upon the strap in the opposite direction, the dog 35 tends to release its grip so that the strap will be readily removed from its position over the plate or flange 37. The gripping dog 35 is provided between its gripping surface and the pin 36 with an inwardly extending slot 35^c adapted to receive the body portion of the strap 27 after the strap has been passed around the box or package. This supply portion of the strap is adapted to be held in this slot 35^c by frictional engagement with a ball 38 which is pressed downwardly by a coil spring 39 engaging

a recess in the gripping dog 35 and an aligning recess in the overhanging passage of the boss 34. A threaded plug 40 adjustably engages the upper end of this spring, and this plug may be adjusted to vary the compression of the spring which, in addition to maintaining the ball 38 in contact with the supply portion of the strap 27, forces the dog 35 downwardly into engagement with the upper end portion of the strap 27 which is seated upon the plate or flange 37.

After the strap 27 has been inserted beneath the dog 35 and passed around the box or package, the other end portion 27^b thereof is placed in position to be gripped by a movable pair of gripping devices comprising a block 44 which is slidably mounted on the front portion of the base plate 33 at the end thereof opposite the block 34. This block 44 is secured by cap screws 45 to the end of a bar 46 which is slidably mounted on the base plate for movement parallel to the front edge thereof and parallel to the direction in which the strap is passed around the package. As shown in Figs. 2 and 5, the block 44 comprises an overhanging portion 44^a which is curved to conform to the curvature of the upper end of the contacting gripping dog 47, pivotally mounted upon a pin 48 secured in the rear wall of the block. The gripping dog 47 is provided on its under side with a serrated gripping surface 47^a which is adapted to coast with the upper side of the end portion 27^b of the strap when the strap is seated upon the gripping plate or flange 49 formed integrally with and projecting forwardly from the lower part of the block 44. The gripping dog 47 is inclined so that the gripping surface 47^a is offset toward the left, as viewed in Fig. 2, with respect to a vertical plane through the axis of the pin 48, so that a pull upon the strap 27 toward the right, as viewed in Fig. 2, tends to increase the grip of the dog 47 upon the strap, while a pull upon the strap in the opposite direction serves to effect the automatic release of the strap from the gripping dog. This gripping dog 47 is moved into engagement with the strap by a coil spring 50 which engages a passage 51 formed in the overhanging portion of the block 44, with one end thereof engaging the inclined upper surface of the gripping dog and with the other end thereof engaging a plug 52 which threadably engages the passage 51 to permit adjustment of the compression of the spring.

The bar 46, to which the block 44 is attached by the cap screws 45, is mounted to slide in a groove 56 which is formed in the upper side of the base plate 33, as shown particularly in Figs. 7 and 12, and it is held against upward movement by a bracket or frame 57 and a block 58, both of which are secured to the base plate 33 by screws 59 passing upwardly therethrough, so that they bridge the groove 56 in spaced relation to each other. The normal retracted position of the bar 46 may be varied by a set screw 53 threadably engaging a lug 54 on the base plate 33 and adapted to contact at its ends with a projection on the block 44. The extremity of the bar 46, opposite the block 44, is reversely bent, as shown in Fig. 12, to overlie the end of a lever 60 which is pivotally secured to the end of the bar by a pin 61. The lever 60 extends rearwardly over the base plate 33, as shown in Fig. 5, and has an intermediate part thereof pivotally connected by a pin 62 with a link 63, the forward end of which is pivotally secured to the stationary block 58 by means of a pin 64 passing through the upper and lower flanges 58^a and 58^b, respectively, of this block, as shown in Fig. 12. The lever 60 is

adapted to be oscillated about the pin 62 to cause it to assume the position shown by dotted lines at 60^a in Fig. 5, thereby causing movement of the block 44 toward the block 34 for the purpose of drawing the strap 27 taut around the box or package. The lever 60 is reinforced on its upper side by a bar 60^b which has the forward portion thereof bent upwardly to overlie the rear end of the link 63 and engage the pin 64, as shown in Fig. 7, and the rear end of the lever 60 is reversely bent to form a part 60^c which extends parallel to the body portion thereof and which is adapted to receive beneath it the rear flattened end 65^a of a link 65. This link is pivotally connected to the lever 60 by a pin 66 which passes vertically through the body portion of the lever, through the reinforcing bar 60^b and through the reversely bent portion 60^c. These parts are embraced and held against upward movement by a yoke 67 which is secured to the base plate 33 by screws 68 extending upwardly through the plate, as shown in Figs. 5 and 7. The forward end of the link 65 has a flange 65^b lying in a vertical plane, which engages the slot 69^a formed in a crank arm 69 which is constructed integrally with the hub 70^a of an operating lever 70 adapted to be manually manipulated to effect the stretching of the strap by causing the block 44 to move toward the block 34. The flange 65^b of the link 65 is pivotally connected to the crank arm 69 by a pin 71, and the hub 70^a of the operating lever is secured by a transverse pin 72 upon a shaft 73 which is journaled in bushings 74 mounted in apertures formed in upwardly extending arms or posts 75 secured to or formed integrally with the base plate 33, as shown particularly in Fig. 5. A washer 76 of leather or other friction material is secured to the side of one of the posts 75 to bear against the hub 70^a of the lever handle 70, and a coil spring 77 is mounted on the shaft 73 to bear at one end against a collar 78 fixed on the shaft and at the other end against a washer 74^a at the end of the bushing 74 which is adjacent to the hub 70^a, and thus hold the shaft 73 in its bearings while maintaining the hub 70^a in frictional contact with the leather washer. This construction is adapted to hold the lever 70 in any desired adjusted position, preliminary to the operation of manipulating it for the purpose of drawing the strap taut. Upon movement of the lever 70 to the rear, that is, toward the left as viewed in Fig. 7, the rear end of the lever 60 is moved in a forward direction and the forward portion of this lever swings outwardly about the pin 62 until the lever occupies the position shown by the dotted lines 60^a in Fig. 5. This movement of the lever causes the bar 46 to slide on the base plate with a corresponding movement of the block 44 with respect to the block 34. An important advantage of this construction is that the operation of the lever 70 produces a rapid relative movement of the blocks 34 and 44 during the early part of the stretching operation when the strap is comparatively slack, while the rapidity of motion decreases and the force exerted upon the strap increases as the final stages of the stretching operation are approached, thus making it possible to draw a strap taut in a single operation of the lever 70.

The sealing of the overlapping ends of the strap, by the application thereto of a seal 30, is effected by a movable head 80 comprising a pair of side plates 81 which are pivotally mounted on a shaft 82 fixed in the lower part of the posts 75, as shown in Figs. 7 and 8. The plates 81 are

notched on their upper sides, as shown at 81^a, to receive the shaft 73 when the head 80 is in its uppermost position, and these plates are adapted to receive between them a pair of jaw members 83 which are pivotally mounted upon pins 84 secured in the plates. Each jaw member 83 is provided on its inner side with a curved surface 83^a concentric with its pivotal axis, as shown in Figs. 8 and 13, and adapted to move in proximity to the curved surface on the other jaw member. Between these curved surfaces, below the line of their nearest proximity, there is mounted a seal supporting member or saddle 85 which is substantially triangular in cross-section, having curved surfaces 85^a which are adapted to coact with the curved surfaces 83^a of the jaw members, as shown in Figs. 13 and 14. This saddle 85 is provided at each end with an integral projecting trunnion 85^b and these trunnions engage apertures in the side plates 81 to support the saddle in position between the jaw members which are thus capable of relative movement without disturbing the position of the saddle. The saddle 85 also carries a stop 86 which is adapted to engage the end of the back wall of a seal 30 to position the seal between the jaws when it is moved thereto from the magazine as hereinafter described. The lower portions of the jaw members 83 are provided with inwardly projecting hooks or jaws 83^b having notches 83^c therein to receive the lower portions of the side walls 30^b of the seal 30 when this seal is in position between them, as shown in Fig. 7. The lower walls or shoulders 83^d of these notches engage the extreme edges 30^d of the seal and thus hold the seal in place in position to straddle the overlapping ends of the strap 27 when the head 80 is lowered from its normal upper position, shown in Fig. 7, to its lower position, shown in Fig. 8. The jaw members 83 are undercut above the jaws 83^b as shown at 83^e and they are further provided with slots 83^f, located in vertical planes, which extend inwardly from the lower edges through the jaws 83^b and through the curved surfaces 85^a. These slots 83^f are engaged by cutting dies 87 which are in the form of flat plates fitting in the slots and having cutting edges 87^a which project beyond the margins of the recesses 83^e in the jaws and which are flush with the curved surfaces 83^a of the jaws at their inner ends, as shown in Fig. 14. These die plates 87 are engaged by the pivot pins 84 about which the jaws move and also by pins or rivets 88 which pass transversely through the jaws and the die plates, thus holding the die plates rigidly in position in the slots of the jaws. When a seal 30 is initially placed between the jaws, it occupies the position shown in Figs. 7 and 10, with the edges 30^d of the side walls of the seal engaging the notches 83^c in the opposite faces of the jaws. The head 80 is then lowered until the seal 30 straddles the overlapping ends of the strap 27. The next operation is to effect a relative movement of the jaws 83 about their pivot pins 84 with the result that the side walls of the seal are bent inwardly, as shown in Fig. 13, to underlie the overlapping strap ends and, preferably, to overlap each other. During this relative movement of the jaws 83, the dies 87, which are mounted within the slots 83^f of the jaws, cause the edges of the strap and seal to be sheared transversely, as shown in Fig. 14, with the result that a joint is formed having the interlocking shoulders shown in Fig. 4, where the parts 32 are the projections which have been deflected laterally by the edges of the cutting dies.

The jaw members have arms 83ⁱ which extend upwardly from the pivot pins 84 and which are pivotally connected at their upper ends by pins 89 with links 90 mounted to engage slots formed in the upper ends of these arms. The links 90 are pivotally connected by pins 91 with opposite sides of the hub portion 92^a of an operating lever 92 which is pivotally mounted on a pin 93 carried by the side plates 81 of the head. The turning of the lever 92 about the pin 93 is adapted to spread the links 90 and the arms 83ⁱ of the jaw members so that the jaws 83^b of these members are moved inwardly toward each other to effect the operations upon the seal 30 which have previously been described. When the head 80 is in its uppermost position, as shown in Fig. 7, the elongated hub 92^a of the operating lever is positioned endwise between the arms 83ⁱ of the jaw members and a projection 92^b on the hub engages a spacer bar 94 which extends between the side plates 81, thus limiting further movement of the lever 92 toward the left, as viewed in Fig. 7. The jaw member 83 which is nearest the pivotal axis 82 of the head 80 is connected to the pin 82 by a pair of links 96 and 97. The link 96 is pivotally connected to the jaw member by a pin 98 and is pivotally connected at its other end to the link 97 by means of a pin 99. The lower end of the link 97 is pivoted on the pin 82 which has sleeves 100 mounted thereon for spacing the link midway between the side plates 81. The link 96 projects into a slot 97^a formed in the link 97 and this end of the link 96 is rounded on the lower corner thereof, as shown at 96^a, to permit relative angular movement of the two links in an upward direction, as shown in Fig. 8, while preventing relative angular movement in the opposite direction beyond a point where the two links are in alignment with each other, as shown in Fig. 7, due to the engagement of the angular upper corner of the link 96 with the end wall of the slot 97^a. When the two links 96 and 97 are thus in alignment, the axis of the pin 99 is located below or to the right of a plane containing the axes of the pins 82 and 98 so that the two links thus act as a toggle connection between the jaw members 83 and the pivotal axis of the head 80, thereby preventing relative movement of the jaw members while the links occupy this position. This toggle connection permits the head 80 to be moved downwardly by an operating lever 92 without relative movement of the jaw members 83 and with this lever in the position shown in Fig. 7, until the seal 30 held between the jaws 83^b has been passed over the overlapping strap ends. At this point in the operation, the link 97 engages a stop member 101 which has a threaded engagement with an aperture formed in the base plate 33 so that it may be adjusted vertically and secured in the desired position by a lock nut 102. When the link 97 contacts with this stop member 101, the link 97 is held against further movement and the toggle connection is then broken upon continued downward movement of the head 80. This allows the lever 92 to move in a forward direction about its pivot 93, thereby separating the arms 83ⁱ of the jaw members 83 and causing the lower parts of the jaw members to close upon the strap and seal to effect the bending of the arms of the seal about the overlapping strap ends and then the shearing of the edges of the strap and seal.

In order to permit the lower portions 83^b of the jaw members to engage the side walls of the seal 30 with resilient pressure when the seal 30

is inserted between the jaws members with the head 80 in the elevated position shown in Fig. 7, one of the links 90 is provided with an elongated slot 90^a for engagement by the pin 89 which connects that link with the adjacent jaw member, as shown in Fig. 8, thus allowing a limited pivotal movement of this jaw member with respect to the connected link 90. The jaw member 83, which is connected to the slotted link 90, is provided with a tubular passage 104 in which is slidably mounted a pin 103 having an enlarged head located in the larger portion 104^a of the passage and having a stem which projects from the jaw member to engage the inner face of the other jaw member. The head of the pin 103 is engaged by a coil spring 105 located in the enlarged portion 104^a of the passage and held in position therein by a threaded plug 106 which is removably mounted in the upper end of the passage, as shown in Fig. 7. The compression of the spring 105 may be adjusted by the movement of the plug 106 in order to cause the pin 103 to engage the other jaw member with the desired pressure. It will be seen that this construction causes the lower portions 83^b of the jaw members to be moved toward each other by the action of the spring 105 within the limits permitted by the elongated slot 90^a so that when a seal 30 is inserted between the jaw members, the flaring side walls 30^b thereof are engaged with resilient pressure by the walls of the recesses 83^c of the jaw members. The seal is thus firmly held while the head 80 is being lowered to bring the seal into engagement with the overlapping strap ends.

The flange 37 of the base plate 33 extends transversely of the base plate for a considerable distance, as shown in Figs. 2 and 5, and it underlies the forward portion of the block 58 which is secured upon the base plate as previously described. The base plate has another forwardly projecting flange 107 which extends outwardly parallel to the flange 37 and spaced therefrom so that an inwardly projecting notch or opening 108 is formed between these flanges in registry with the path of movement of the jaws 83 as the head 80 is lowered, thus permitting the jaw members to be closed about the seal and strap in this opening 108 while the strap is supported on the adjacent flanges 37 and 107. The flange 107 is beveled on its upper side at its forward end as shown at 107^a to correspond with the bevel on the forward edge of the flange 37, to permit the convenient insertion of the strap. At the commencement of the operation of applying a strap 27 around a box or package, the free end 27^a of the strap is first inserted between the gripping dog 35 and the flange 37 with the extremity of the strap projecting across the opening 108 and resting upon the flange 107, as shown in Fig. 2. The strap is then passed around the box or package and the portion 27^b thereof, which is connected to the source of supply, is passed beneath the gripping dog 47 so that it is held against the flange 49 carried by the movable block 44. After being passed beneath the gripping dog 47, the supply portion 27^b of the strap is placed in position over the extremity of the free end 27^a of the strap on the flange 107, as shown in Fig. 2, and beneath the forward end of the overlying portion of the bracket 51. The strap is then inclined upwardly toward the left, as viewed in Fig. 2, and passed over a stationary cutting die 110, from which point the supply portion of the strap is carried over the flange 37 of the base plate and caused to occupy the slot 35^c in the gripping dog

35. The stationary cutting die 110 has the form shown particularly in Fig. 7, being provided with two oppositely extending blades 110^a, each of which has a cutting edge 110^b. At its middle point, the die has an upwardly extending lug 110^c which is apertured for engagement by a bolt 111 by which it is secured to the flange 58^a formed on the block 58. When thus secured in place by the bolt 111, the lower edge of the die 110 rests upon the upper surface of the base plate so that angular movement thereof is prevented. The under portions of the blades of the cutting die 110 are inclined upwardly as shown at 110^d in Fig. 7 to facilitate the insertion beneath the cutting blade of the free end portion 27^a of the strap.

The stationary cutting die 110 is adapted to cooperate with a cutting blade 112 detachably mounted upon a shearing lever 113 which is pivotally supported on the bolt 111 and which is pivotally connected with one end of a link 114 having its other end pivotally connected to a pin 114^a stationarily mounted upon the adjacent side plate 81 of the head. The pin 114^b which connects the lever 113 with the link 114 has a coil spring 114^c connected thereto and this spring is attached at its other end to a stationary pin 114^d carried by the base plate. This spring 114^c tends normally to rock the shearing lever 113 about its pivot 111 in a direction to elevate the cutting blade 112. The action of this spring 114^c tends also to elevate the head 80 about the pin 82 since it tends to move the pin 114^a toward the pin 114^d, as viewed in Fig. 7, and the extent of this movement is limited by the engagement of the bushings 74 on the pin or shaft 73 with the notches 81^a which are formed in the side plates. As the head 80 is lowered by a forward pressure on the lever 92, the first effect of the downward movement of the head is to lower the shearing lever 113 against the action of the spring 114^c until the shearing blade finally engages the upper supply portion of the strap 27 and shears it off by cooperating with the underlying cutting die 110. Immediately after the strap is cut off from the source of supply by the action of the blades 110 and 112, the seal 30 carried between the jaws 83 engages the upper end portion of the strap which has just been cut off from the source of supply and forces it downwardly against the underlying end portion 27^a. As soon as this has occurred, the link 97 engages the previously adjusted stop member 101 to break the toggle connection formed by the links 96 and 97 so that these links then move upwardly, as viewed in Figs. 7 and 8, and the lever 92 is then permitted to move forwardly about its pivot 93 with the result that the upper arms 83^a of the jaws are separated and the lower parts 83^b of these jaws bend the walls 30^b of the seal inwardly beneath the overlapping strap ends, causing them to assume the relationship shown in Figs. 8 and 13. During this movement of the lever 92, and the resulting movement of the jaws, the edges of the strap and seal are sheared to form an interlocking joint, as shown in Fig. 14. When this operation of forming the joint is completed, the lever 92 is moved toward the left, as viewed in Fig. 8, thereby releasing the lower parts of the jaws from engagement with the strap and seal and then effecting the elevation of the head 80 and of the shearing lever 113 until these parts assume their normal upper position shown in Fig. 7. The operator then reverses the motion of the stretching lever 70 with the result that the block 44 is moved toward the right, as viewed

in Fig. 2, thereby releasing the sealed strap from the grip of the dog 47. The tool may then be moved toward the left, as viewed in Fig. 2, and away from the strap to release the strap from the dog 35. As this is done, the flanges 37 and 107 are withdrawn from their positions beneath the strap and the strap is then permitted to snap downwardly in contact with the top surface of the box or package.

The seal storing and feeding mechanism which introduces the seals 30 into the space between the portions 83^b of the jaw members is mounted at one side of the head 80 and is supported directly or indirectly upon the base plate 33 in such a manner that it may be detached and replaced when desired. The seals are supplied from a vertically extending tubular magazine 115 which comprises a pair of diagonally disposed upright members 115^a which are spaced apart to form a rectangular enclosure by means of a pair of surrounding rectangular collars 115^b and a lower member 115^c of rectangular cross-section. The lower end of the magazine is embraced by a U-shaped member 115^d which is attached to the member 115^c and the lower member 115^b and which has its lower horizontal portion arranged to extend beneath and within a slot 116^a formed in a horizontal guide member 116. The outer end of this guide member is supported from the base plate 33 by a bracket 117 and the inner end rests upon the block 34 to which it is secured by a screw 118 passing downwardly therethrough and also through the lower guide finger 119 of the guide member which is secured thereto by a screw 120. The lower portion of the U-shaped member 115^d is secured to the guide member 116 by a screw 121 and the magazine is thus held rigidly in an upright position so that the seals 30 which are stacked therein in nested relationship are adapted to move downwardly by gravity and to be transferred endwise from the magazine through one of the openings 122 which are provided in the members 115^a and in the member 115^c at the bottom of the magazine, as shown in Fig. 10. When moved from the magazine, the seals are adapted to travel over the previously mentioned guide finger 119 and beneath an upper guide finger 123 which is supported by a bracket 124 detachably secured by screws 125 to the block 58 in which the pivot pin 64 is mounted. The upper guide finger 123 thus maintains the seals 30 against upward displacement from the lower guide finger 119 so that the seals are adapted to travel in succession from the intervening slot 126 to a position between the portions 83^b of the jaws, where they engage the stop 86 heretofore referred to.

The movement of the seals 30 from the magazine along the slot 126 to the jaws is effected by means of a plunger 130 which is slidably mounted in a rectangular groove 116^b formed in the guide member 116, as shown particularly in Figs. 9 and 10 and this plunger moves transversely to the movement of the sealing head 80. At its inner end, this plunger carries a longitudinal rib 130^a on its upper side and this rib terminates in a projection 130^b extending beyond the end of the plunger. When the plunger 130 is withdrawn toward the left from the position shown in Fig. 10, the seals in the stack within the magazine fall by gravity and the lower seal rests upon the guide member 116 which has the upper portions of its lateral sides beveled as shown at 116^d to conform to the flare of the side walls of the seal. Then, when the plunger 130 is again restored to

the position shown in Fig. 10, the projection 130^b first enters as a wedge between the top wall 30^a of the lowermost seal and the top wall of the next seal above, thereby separating these seals, which are preferably cemented together as heretofore described, and permitting the lowermost seal to be moved readily over the guide member 116^b by the engagement with the end of the top wall thereof of the end surface 130^d of the plunger. This moves the lowermost seal from the magazine through the inner opening 122 until it occupies a position on the lower guide finger 119, as shown in Fig. 10, and, at the same time, other seals which have previously been moved from the magazine to the guide finger 119 are advanced until one of these seals occupies a position against the stop 86 between the portions 83^b of the jaws. The plunger 130 is retained in the groove 116^b by an angular retaining member 131 which is secured to the upper side of the plunger 20 and which has a flange underlying the guide member. This retaining member is cut away at one corner to receive the upwardly extending flange of the bracket 117 by which the outer end of the guide member is supported and this portion of the bracket thus engages the retaining member and serves as a stop to limit the outward movement of the plunger which is effected by a coil spring 132 mounted within the bore 130^c of the plunger and engaging the end of the lower guide finger 119. The spring 132 tends normally to move the plunger 130 toward the left, as viewed in Fig. 10, until the member 131 engages the bracket 117. The movement in the reverse direction is effected by pushing manually upon the ball or handle 133 which is mounted on the outer end of the plunger. The resulting inward movement of the plunger causes the end 130^d of the plunger to engage the lowermost seal and move it onto the guide finger 119. The plunger 130 may move inwardly until its inner end engages the stop formed by the outer end of the guide finger 119 and this movement is sufficient to cause a complete transfer of the lowermost seal from the magazine to the guide finger, as previously described. The spacing of the magazine 115 from the movable head 80 is so arranged with respect to the lengths of the seals 30 that an integral number of seals lie on the guide finger 119 between the magazine and the head and the amplitude of movement of the plunger 130 is such that each inward movement thereof advances the series of seals on the guide finger a distance equal to the length of one seal. After each inward movement of the plunger 130, the spring 132 automatically returns it to its normal retracted position in readiness to engage and feed the seal which is then in the lowermost position within the magazine. Thus, the apparatus may be conveniently and quickly operated to feed a succession of seals from a storage magazine to a position between the jaws. It will be noted that the seals are fed endwise and are moved between the portions 83^b of the jaws in such a manner that the side walls 30^b of the seals engage the notches 83^d at the tips of the jaws. Each seal is thus automatically held between the jaws as soon as it is fed thereto from the magazine and is in readiness for the downward movement of the head 80 to position the seal upon the overlapping strap ends, preliminary to operating the lever 92 and thereby effecting relative movement of the jaws to bend the side walls of the seal about the strap and to shear the edges of the strap and seal to form an interlocking

joint. By the operation of this tool, a stack of seals arranged in the magazine may be quickly fed in succession to the head 80 and the head 80 may be quickly and conveniently operated for supplying the seals to overlapping strap ends so that many advantages are obtained as compared with the practice of placing the seals manually between the jaws. When the lowermost seal in the magazine rests upon the guide member 116, the inward movement of the plunger 130 is adapted to move that seal only toward the head 80 because the upward projection of the plunger above the top edge of the guide member is equal to the thickness of the top wall of the lowermost seal and, in addition, the forward projection 130^b on the plunger is adapted to effect an automatic separation of the lowermost seal from the next higher one in the stack which is prevented from moving outwardly from the magazine by the engagement of its top wall and side walls with the walls of the magazine around the opening 122.

Although one form of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments coming within the scope of the appended claims.

I claim:

1. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device, a pivotal support for said device, means for feeding a channel-shaped seal into said device, and means mounted on the device for swinging the same in an arcuate path to bring said seal into engagement with said overlapping strap ends.

2. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device, a pivotal support for said device, means movable transversely to the movement of the sealing device for feeding a channel-shaped seal endwise into said device, and means mounted on the device for swinging the same bodily in a downward direction to bring said seal into engagement with said overlapping strap ends.

3. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a pivotally mounted sealing head having a pair of sealing jaws, a support for said head, means for feeding a channel shaped seal into position between said jaws, and means mounted on and carried by said head independently of said support for moving said head to a position wherein said seal carried by said jaws engages said overlapping strap ends.

4. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing head having a pair of sealing jaws, means for feeding a channel-shaped seal into position between said jaws, means for causing said jaws to exert a resilient pressure on said seal, means mounted on the head for moving the same to a position in which the jaws engage the seal with said overlapping strap ends, and means actuated by the continued movement of said last named means for operating said jaws to deform said strap ends and said seal to form an interlocking joint.

5. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device including a movable head having relatively movable jaws, seal supply means located adjacent said head, means for moving a seal from said supply means to a position be-

tween said jaws, means mounted on the head for moving the same to cause said seal to engage said overlapping strap ends, and means actuated by said last named means for thereafter causing relative movement of said jaws.

6. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device normally occupying a position removed from said strap ends, means for feeding a seal into said sealing device to be supported thereby while in said normal position, means comprising an operating lever mounted on the device for moving the same from said normal position to position said seal over said overlapping strap ends, and means actuated by continued movement of said lever for thereafter deforming said seal and said overlapping strap ends to form an interlocking joint.

7. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a head movable transversely to said strap ends and having a pair of relatively movable jaws, said head occupying normally an elevated position with said jaws removed from said strap ends, a seal magazine mounted at the side of said head and adapted to store a plurality of channel-shaped seals, means for moving a seal from said magazine endwise into a position between said jaws, means mounted on the device for moving said head bodily downward to position said seal over said strap ends, and means actuated by said last named means for thereafter effecting relative movement of said jaws to bend said seal about said strap ends and to deform the seal and strap ends to provide an interlocking joint.

8. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a head movable transversely to said strap ends and having a pair of relatively movable jaws, said head occupying normally an elevated position with said jaws removed from said strap ends, a seal magazine mounted at the side of said head and adapted to store a plurality of channel-shaped seals, means for moving a seal from said magazine endwise into a position between said jaws, means comprising a lever pivoted on the head and connected to said jaws for moving said head bodily to cause said jaws and the seal between them to embrace said overlapping strap ends, and means actuated by the pivotal movement of said lever with respect to said head for effecting relative movement of said jaws to bend said seal about said strap ends and to deform said strap ends and seal to provide an interlocking joint.

9. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a pivoted sealing device, means for feeding a seal into the device, and a single actuating member mounted on the device for moving said device to cause the seal to engage the overlapping strap ends and then operating the device to deform the strap ends and seal.

10. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device, means for feeding a seal into the device, an operating lever mounted on the device for actuating the same to bring the seal into engagement with the strap ends, and means actuated by the lever to deform the seal and strap ends.

11. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a pivoted sealing head having a pair

of sealing jaws, means for feeding a seal into position between the jaws, means mounted on the head for moving the jaws bodily to bring the seal into engagement with the overlapping strap ends, and means actuated by said last named means for thereafter operating the jaws to deform the strap ends and seal to form an interlocking joint.

12. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a pivoted sealing device, means for feeding a seal into the device, and a single actuating member movable with and relative to the device for respectively placing a seal in engagement with the overlapping ends and operating the device to deform the strap ends and seal.

13. The combination in strap sealing apparatus, of means for holding a strap with its ends

overlapping, a pivoted sealing device, means for feeding a seal into the device, and a single actuating member mounted on the device, said member being movable with and relative to the device for respectively placing a seal in engagement with the overlapping strap ends and operating the device to deform the strap ends and seal.

14. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device, means for feeding a seal into the device, an operating handle mounted on the device for actuating the same to place a seal in engagement with the strap ends, and means actuated by movement of the handle relative to the device for thereafter operating the same to deform the seal and strap ends.

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